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**INVESTIGATION OF THE EFFECT OF LOW THRUST LEVELS  
ON THE BASE PRESSURE OF A CYLINDRICAL BODY  
AT SUPERSONIC SPEEDS**

REPORT NO. RD-TR-70-11

AD /

*[Signature]*

by

T. A. Martin  
C. E. Brazzel

May 1970

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**U.S. ARMY MISSILE COMMAND**  
Redstone Arsenal, Alabama

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7 May 1970

Report No. RD-TR-70-11

# INVESTIGATION OF THE EFFECT OF LOW THRUST LEVELS ON THE BASE PRESSURE OF A CYLINDRICAL BODY AT SUPERSONIC SPEEDS

by

T. A. Martin  
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Advanced Systems Laboratory  
Research and Engineering Directorate  
U. S. Army Missile Command  
Redstone Arsenal, Alabama 35809

### **Abstract**

Results of supersonic wind tunnel tests are presented which show the effects of varying nozzle geometry, location, and supply pressure on the base pressure of a cylindrical body at zero angle of attack. The purpose of the tests was to investigate the parametric influences in the regions where base pressure is near a minimum, which occurs in the lower range of thrust levels. A bibliography of related experimental results is also included.

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## **I. Introduction**

The base drag on a missile with thrust is generally greatest at low thrust levels and is significantly influenced by the various rocket nozzle geometric parameters. For clarifying the influences of the nozzle geometric parameters, a series of supersonic wind tunnel tests has been conducted with a cylindrical body by using cold, dry air to simulate the rocket exhaust. Nozzle parameters varied were diameter, expansion ratio and expansion angle, longitudinal position, and thrust level.

The basic results of the tests (base pressure variation with nozzle chamber pressure) are presented in plotted form without detailed analysis, but they are arranged to illustrate major parametric influences. These results are repeated in tabular form, and additional nozzle flow parameters and test condition information are shown in the appendix.

## **2. Apparatus**

The model was mounted to the tunnel topwall and aligned with the tunnel flow by means of a fixed swept strut which also provided routing of the instrumentation lines and cold air supply used to simulate the exhaust flow. The external shape of the model was defined by a 4-caliber tangent-ogive nose plus a cylindrical body which was 2 calibers long. Details of the model are shown in Figure 1.

Two types of base configurations were used during these tests. One model configuration, designated as the "open base" configuration, contained an active nozzle mounted concentrically in a larger inactive nozzle. This configuration presented considerable base area which was not adjacent to the region where the exhaust was exiting from the model. Also, this configuration was constructed so that the exit plane of the active nozzle was located at positions other than the plane of the model base. This configuration was made by combining the nozzles (Figure 1b) and the "open base" body (Figure 1a).

The model configurations designated as "closed base" were made by installing the nozzles, including sonic (Figure 1c), conical supersonic (Figure 1d), and contoured supersonic (Figure 1e) into the body identified in Figure 1a as the "closed base" body.

Tunnel No. 1 of the Ballistic Research Laboratories is a continuous flow, supersonic wind tunnel capable of operating over the Mach number range of

1.20 to 5.0. The test section dimensions are 13 by 15 inches. The minimum test Mach number for this model in this facility is 2.5. Complete details of this facility are given by Baughman.<sup>1</sup>

The estimated range of inaccuracy of all data presented herein is as follows:

Mach number,  $\pm 0.008$   
Local model pressure,  $\pm 0.100$  psi  
Air supply pressure,

0 to 15 psi range  $\pm 0.030$  psi  
0 to 100 psi range  $\pm 0.200$  psi  
0 to 300 psi range  $\pm 0.600$  psi

### 3. Presentation of Data

The information presented here consists of:

- a) Justification for direct comparison between results obtained with open and closed base configurations
- b) Observations on the insignificant influence of Reynolds number over the test Reynolds number range
- c) Plotted basic results arranged to illustrate major parameteric influences
- d) Tabulated results.

A detailed listing of the test condition, test configurations, base pressure, and base pressure coefficient variation with nozzle chamber pressure, thrust coefficient (CT), and momentum flux ratio (RMF) is presented in the appendix. The values of CT and RMF have been calculated by using measured values, nozzle physical dimensions, and one-dimensional flow relationships. An index to the tabulated data and symbol notation as used in this tabulation are also shown in the appendix.

Two cylindrical body configurations were tested: a closed base configuration and an open base configuration, which simulated an inactive large boost

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<sup>1</sup> Baughman, L. E., and Kochendorfer, F. D., "Jet Effects on Base Pressures of Conical At. bodies at Mach 1.91 and 3.12," NACA RM E57E06, August 1957

nozzle surrounding an active small sustainer nozzle (Figure 1a). A comparison of results from each of the bodies with identical nozzles is shown in Figure 2. This comparison indicates that effects due to base configuration difference are very slight. On the basis of this comparison, no further reference to the base difference will be made. Excellent repeatability of data acquired in separate test entries is also shown in Figure 2.

A group of nozzles were tested at a Reynolds number lower than the nominal value to extend the range of thrust level. The results are presented in Figure 5 together with results obtained at the nominal Reynolds number. In these results there is a slight but consistent shift in the base pressure ratio at comparable chamber pressure ratios, although different chamber pressures were used to produce the comparable ones. To investigate this shift in base pressure, further testing was conducted both over a greater Reynolds number range and without the standard boundary layer transition strip on the nose. These data, presented in Figure 3, show no consistent trends with Reynolds number over the range in question ( $R_N \approx 0.20$  to  $0.50$  million per inch). On the basis of this observation, it is felt that the shift is due to data acquisition errors and is not a Reynolds number effect.

The basic results from the test are presented in Figures 4 through 19. The nozzle configuration variable for each group of data is shown in Table I.

TABLE I. NOZZLE CONFIGURATION VARIABLES

Configuration Variable	Configuration Constants	Figure No.
Nozzle Mach No.	$L^*/DB = 0.141, \theta_j = 0 \text{ deg}$ $\theta_j = 0 \text{ deg}, D_j/D_B = 0.20$ $\theta_j = 20 \text{ deg}, D_j/D_B = 0.20$	4 5 6
Nozzle Expansion Angle	$M_j = 1.78, D_j/D_B = 0.20$ $M_j = 2.20, D_j/D_B = 0.20$ $M_j = 2.70, D_j/D_B = 0.20$ $M_j = 3.20, D_j/D_B = 0.20$	7 8 9 10

TABLE I. NOZZLE CONFIGURATION VARIABLES (Concluded)

Configuration Variable	Configuration Constants	Figure No.
Nozzle Exit Diameter	$M_j = 1.0, \theta_j = 0$	11
	$M_j = 1.78, \theta_j = 0$	12
	$M_j = 1.78, \theta_j = 20$	13
	$M_j = 2.70, \theta_j = 0$	14
	$M_j = 2.70, \theta_j = 20 \text{ deg}$	15
	$M_j = 3.20, \theta_j = 0 \text{ deg}$	16
Nozzle Exit Position	Nozzle, $D_j/D_B = 0.1$	17
	Nozzle, $D_j/D_B = 0.2$	18
	Nozzle, $D_j/D_B = 0.3$	19

The symbols used in these figures are identified in the following list, while those used with the tabulated data are given in the preface of that section.

$D_B$	Reference diameter of model
$D_j$	Diameter of nozzle at exit plane
$M_j$	Nozzle design Mach number
$M_\infty$	Free stream Mach number
$p_c$	Jet stagnation pressure
$p_B$	Mean base pressure
$p_\infty$	Free stream static pressure
$R_N$	Reynolds number per inch
$X_n$	Location of nozzle exit plane relative to model base, negative rearward
$\theta_j$	Half-angle divergence of nozzles

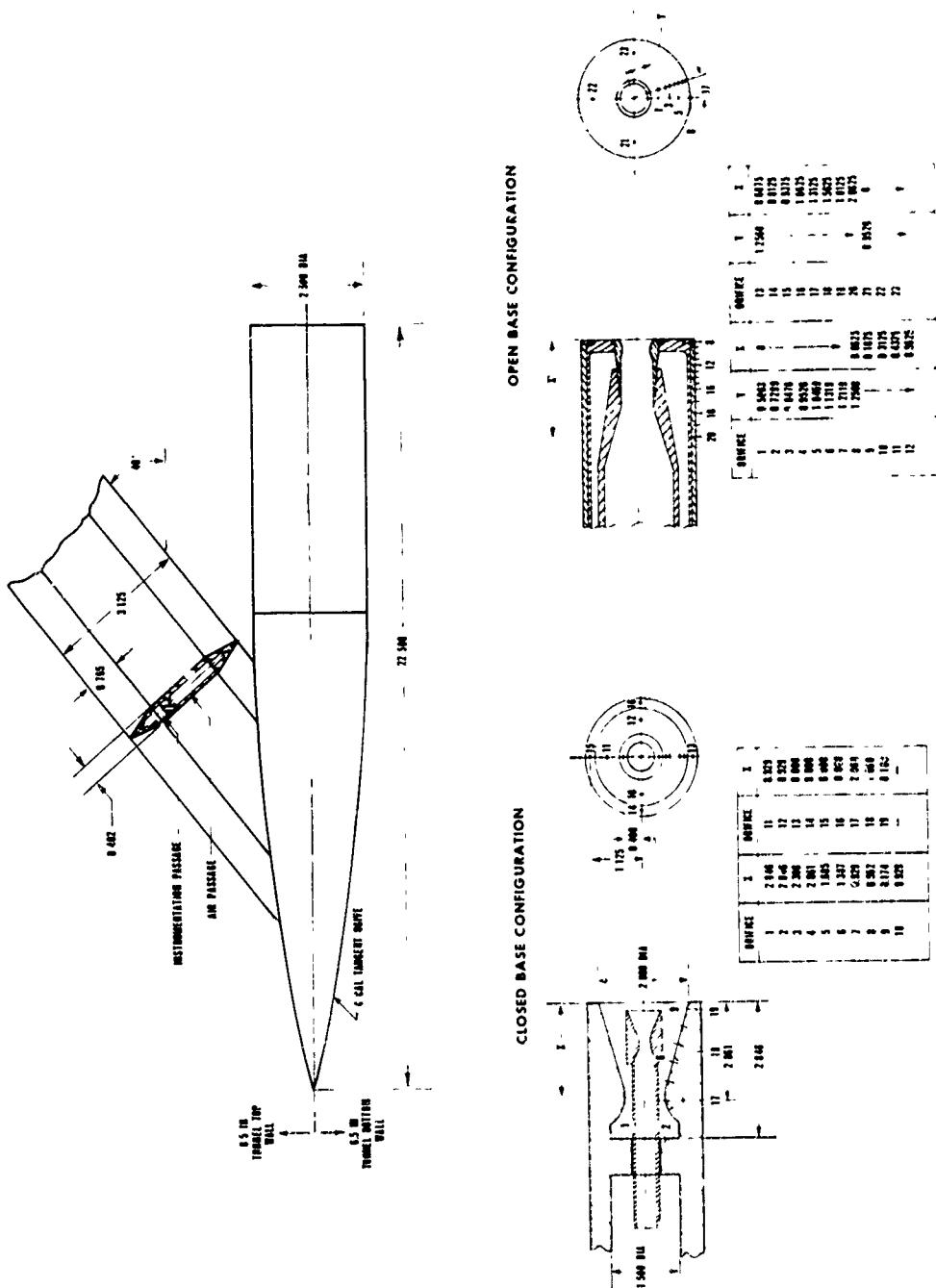


FIGURE 1. MODEL DETAIL

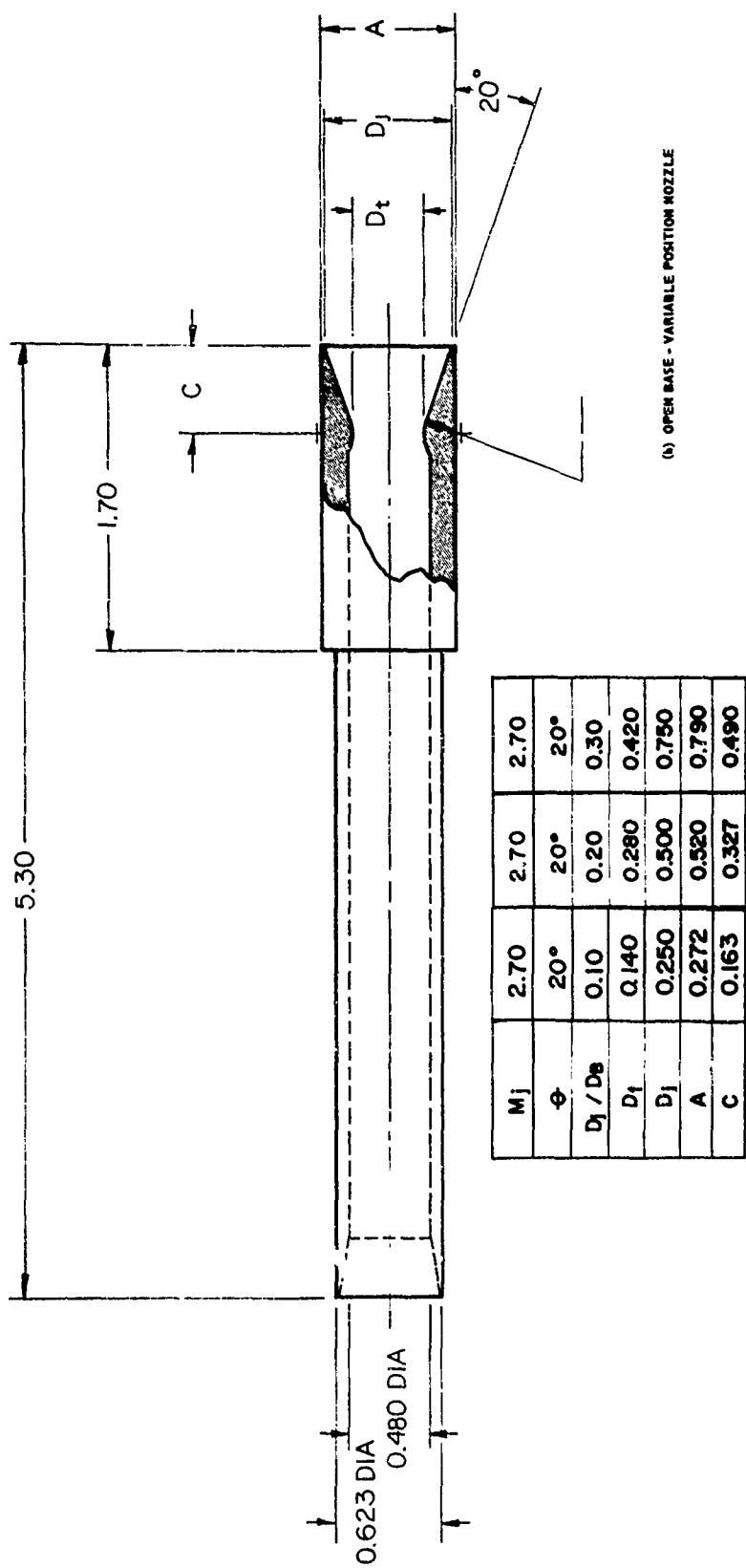
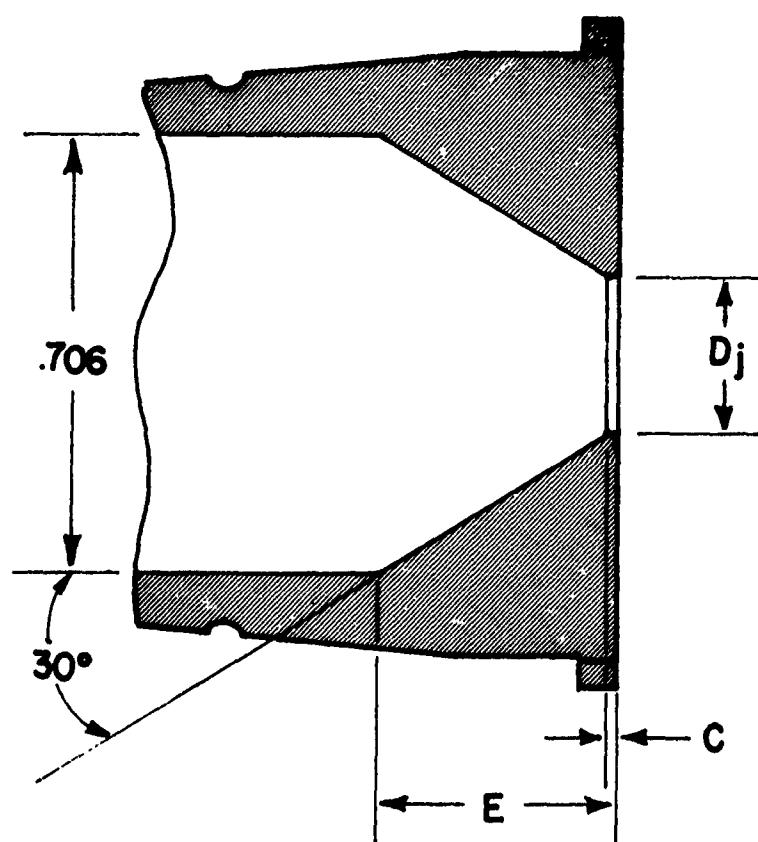


FIGURE 1. MODEL DETAIL (Continued)

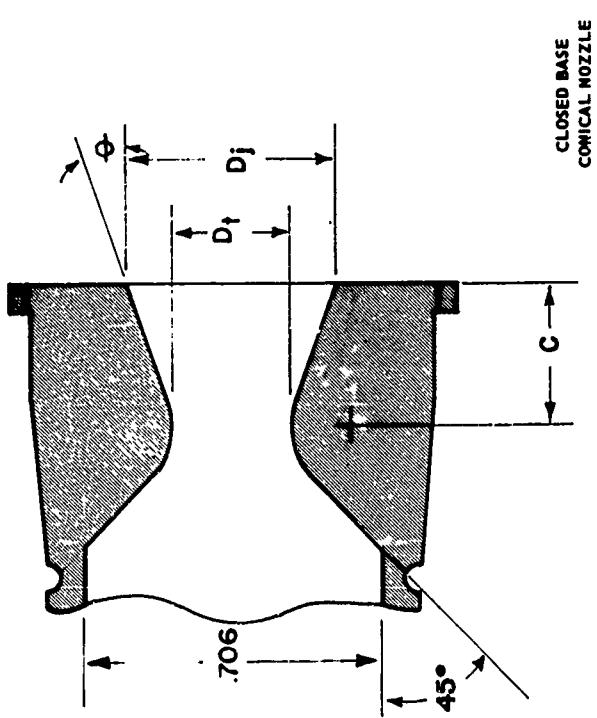
CLOSED BASE SONIC NOZZLE



$M_j$	1.0	1.0	1.0
$\theta$	—	—	—
$D_j/D_B$	0.100	0.140	0.200
$D_j$	0.250	0.352	0.500
$C$	0.010	0.010	0.010
$E$	0.404	0.302	0.191

(c) SONIC NOZZLES

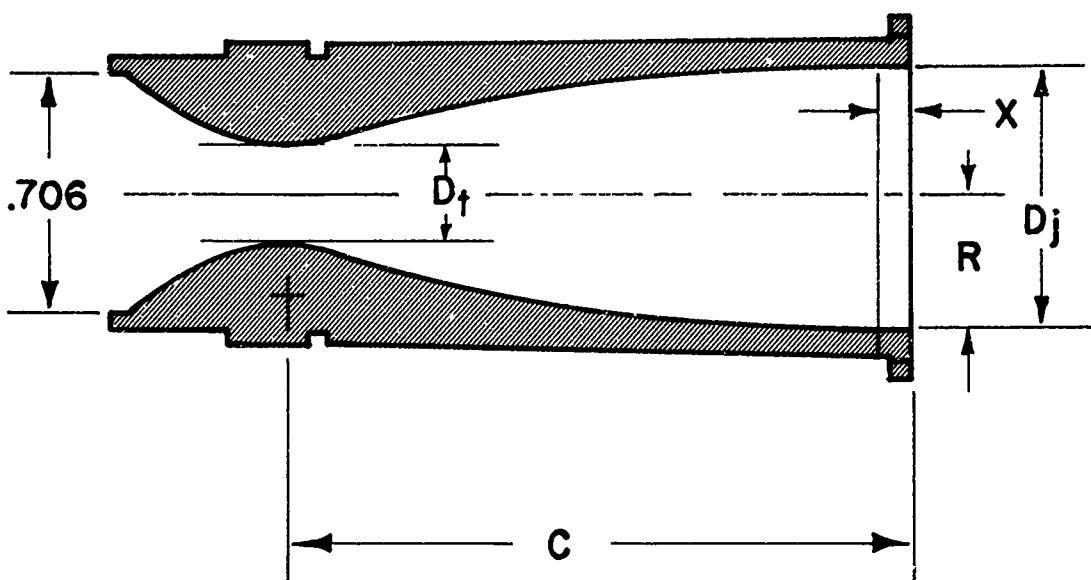
FIGURE 1. MODEL DETAIL (Continued)



M <sub>j</sub>	1.78	1.78	1.78	2.20	2.70	2.70	2.70	3.20	3.80
$\phi$	5°	20°	20°	10°	15°	20°	20°	20°	20°
D <sub>j</sub> /D <sub>a</sub>	.200	.100	.200	.300	.200	.200	.200	.200	.200
D <sub>j</sub>	.420	.209	.420	.630	.353	.280	.280	.420	.221
D <sub>j</sub>	.500	.250	.500	.750	.500	.500	.500	.750	.500
C	.464	.075	.143	.221	.233	.636	.429	.327	.491

(d) CONICAL NOZZLES

FIGURE 1. MODEL DETAIL (Continued)



CLOSED BASE  
CONTOURED NOZZLES

$M_j$	1.78	1.78	2.20	2.70	2.70	3.20	3.20
$\theta$	0	0	0	0	0	0	0
$D_j/D_s$	.168	.200	.200	.200	.252	.200	.320
$D_f$	.352	.420	.352	.280	.352	.220	.362
$D_j$	.420	.500	.500	.500	.629	.500	.800
$C$	.591	.703	.909	1.096	1.382	1.249	1.996

(e) CONTOURED NOZZLES

FIGURE 1. MODEL DETAIL (Concluded)

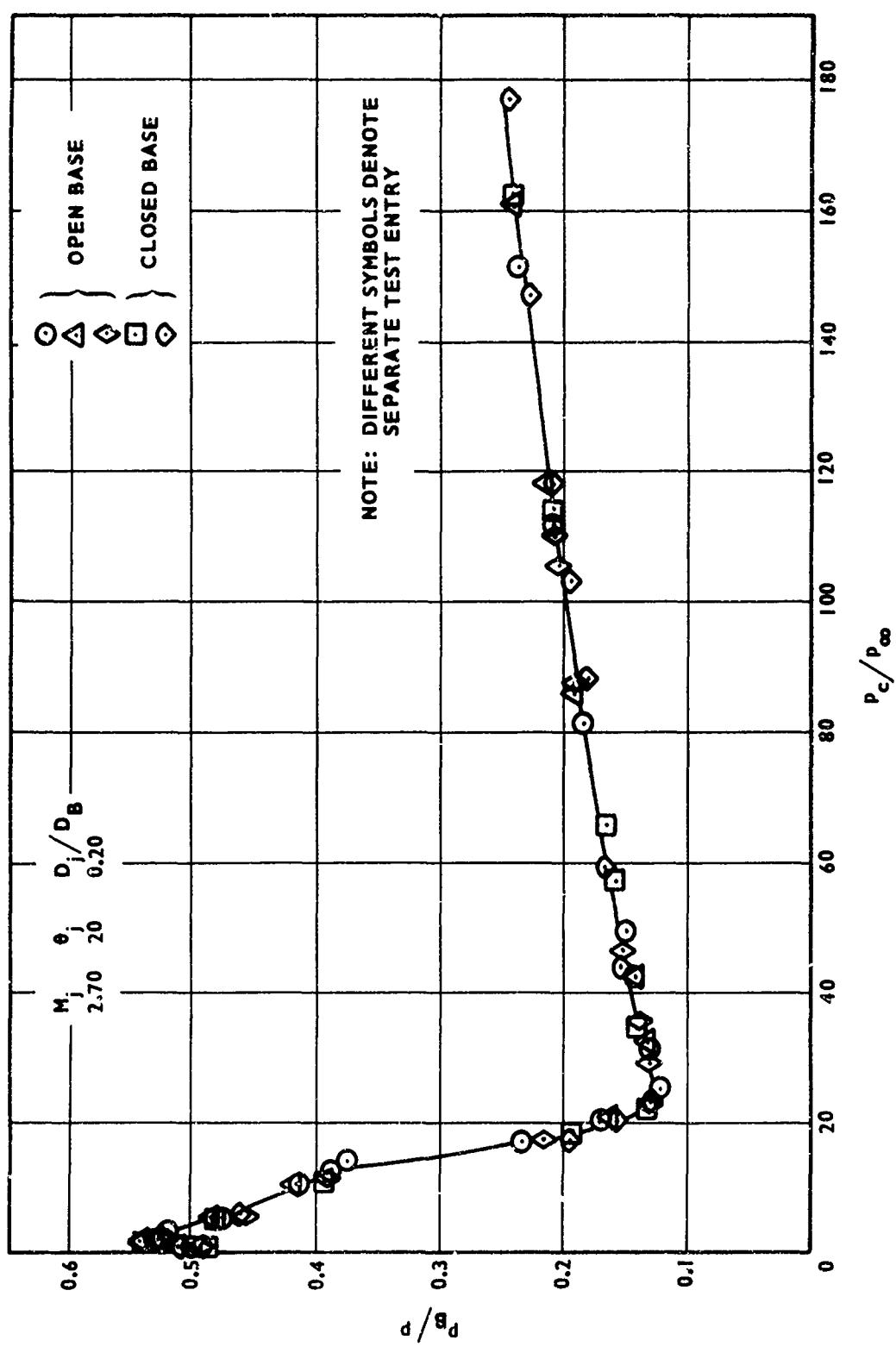
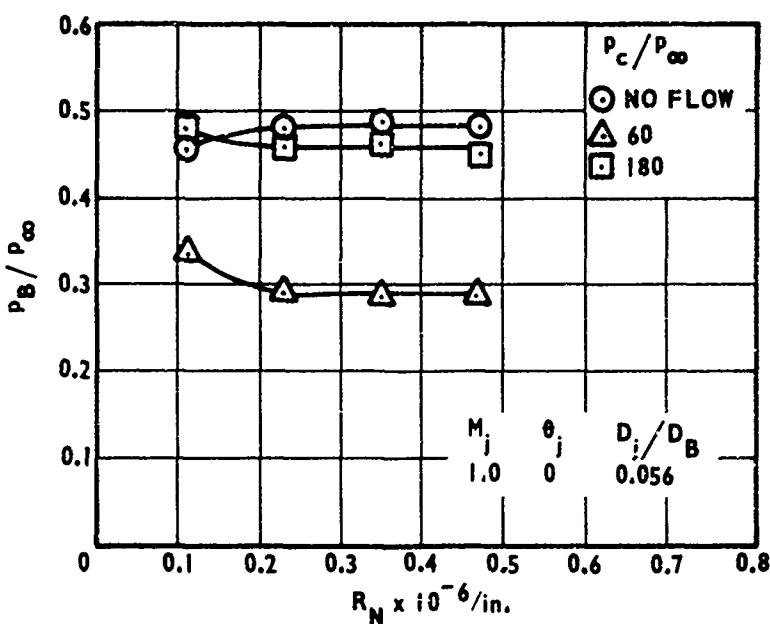
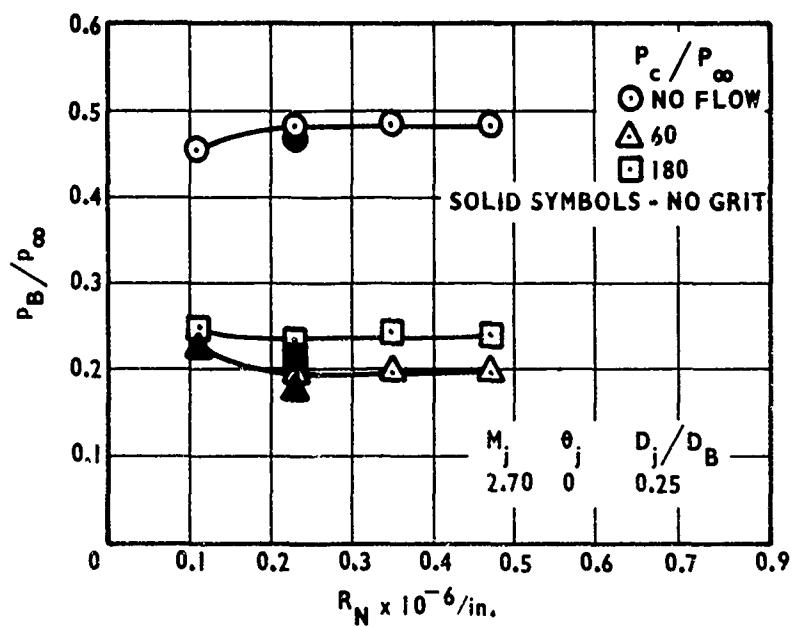


FIGURE 2. BASE PRESSURE FOR OPEN VERSUS CLOSED BASE CONFIGURATIONS



a. SONIC NOZZLE



b. SUPERSONIC NOZZLE

FIGURE 3. REYNOLDS NUMBER EFFECT ON BASE PRESSURE

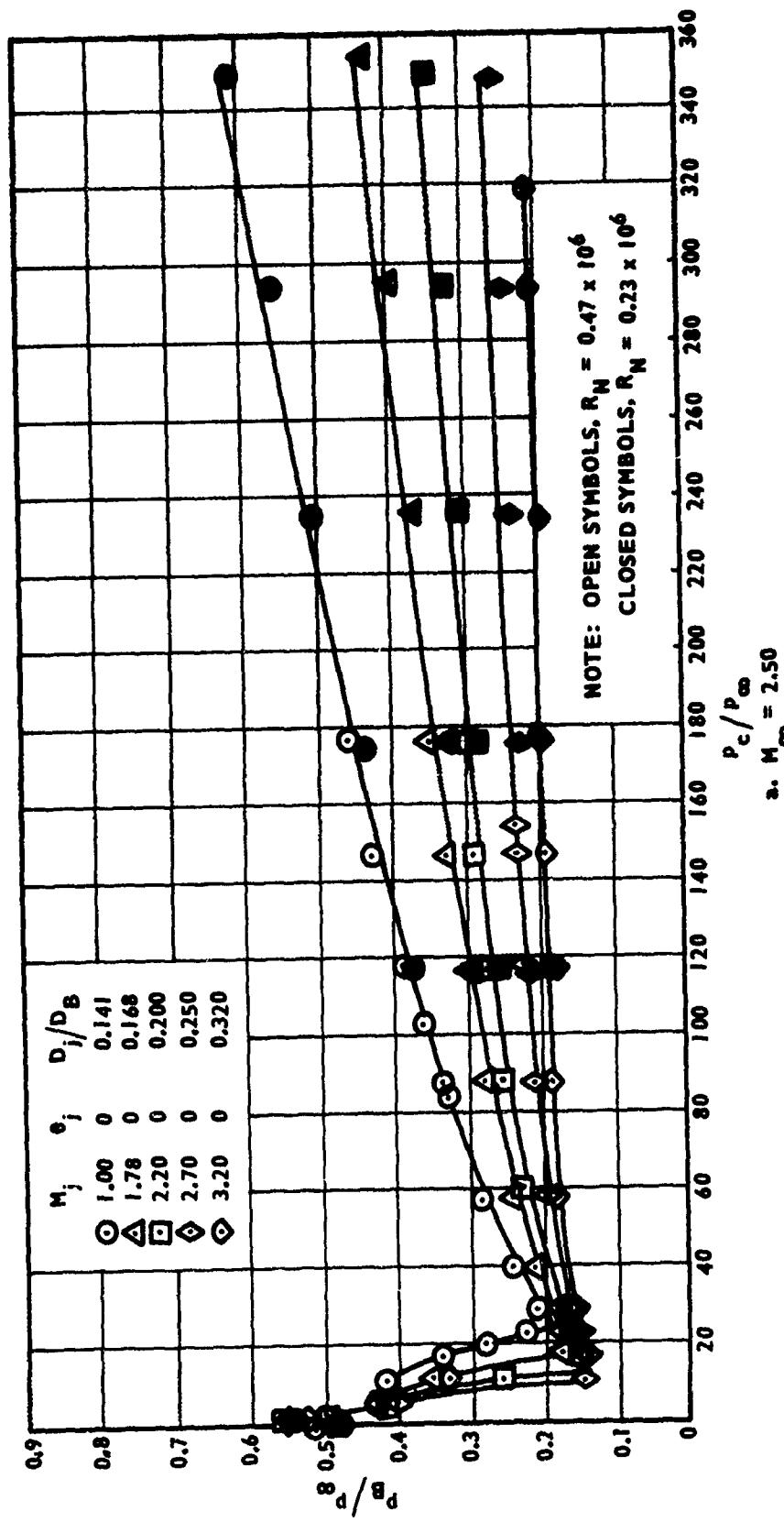


FIGURE 4. EFFECT OF JET MACH NUMBER ON BASE PRESSURE, CONSTANT THROAT DIAMETER

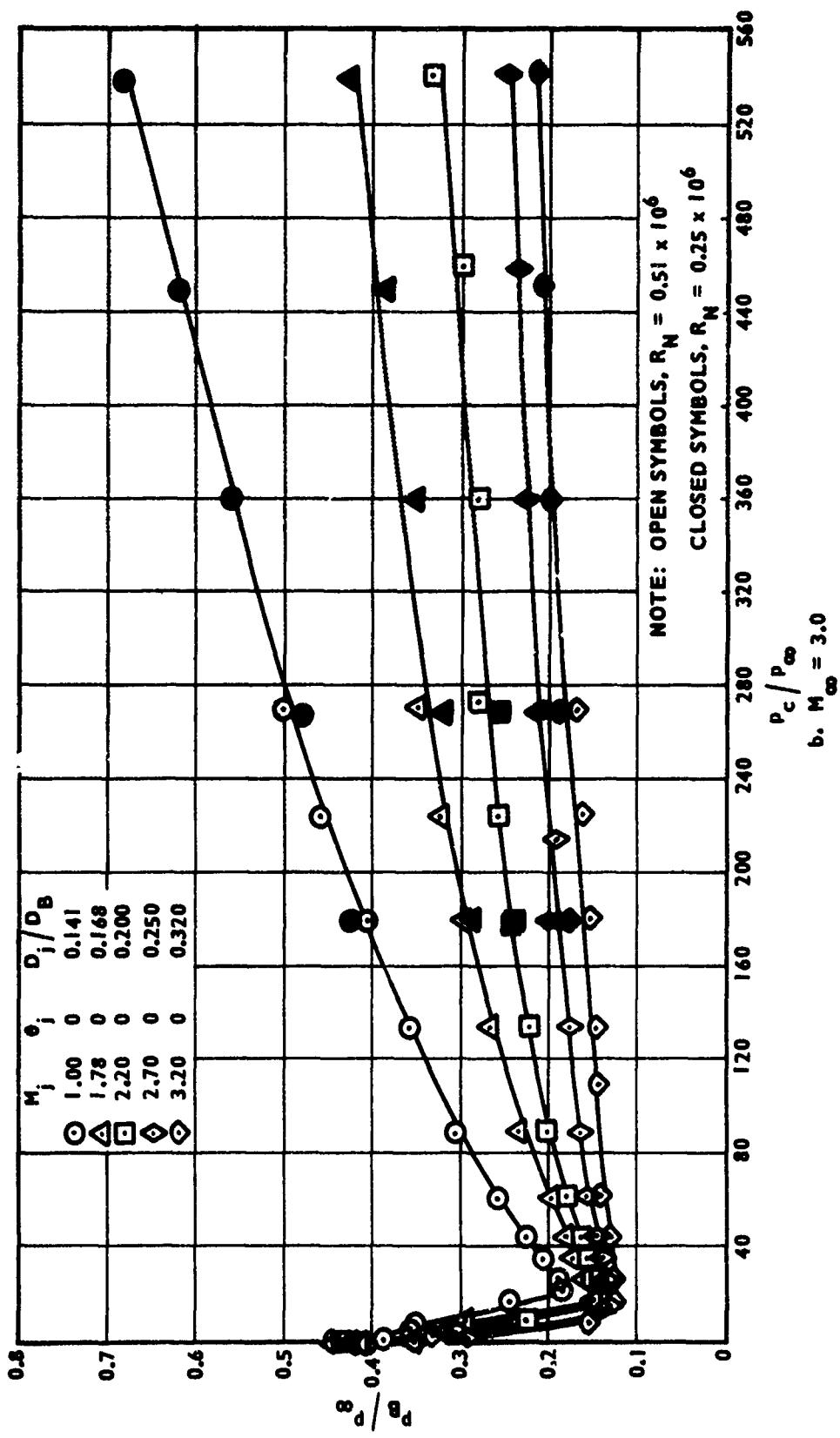


FIGURE 4. EFFECT OF JET MACH NUMBER ON BASE PRESSURE, CONSTANT THROAT DIAMETER  
 (Concluded)

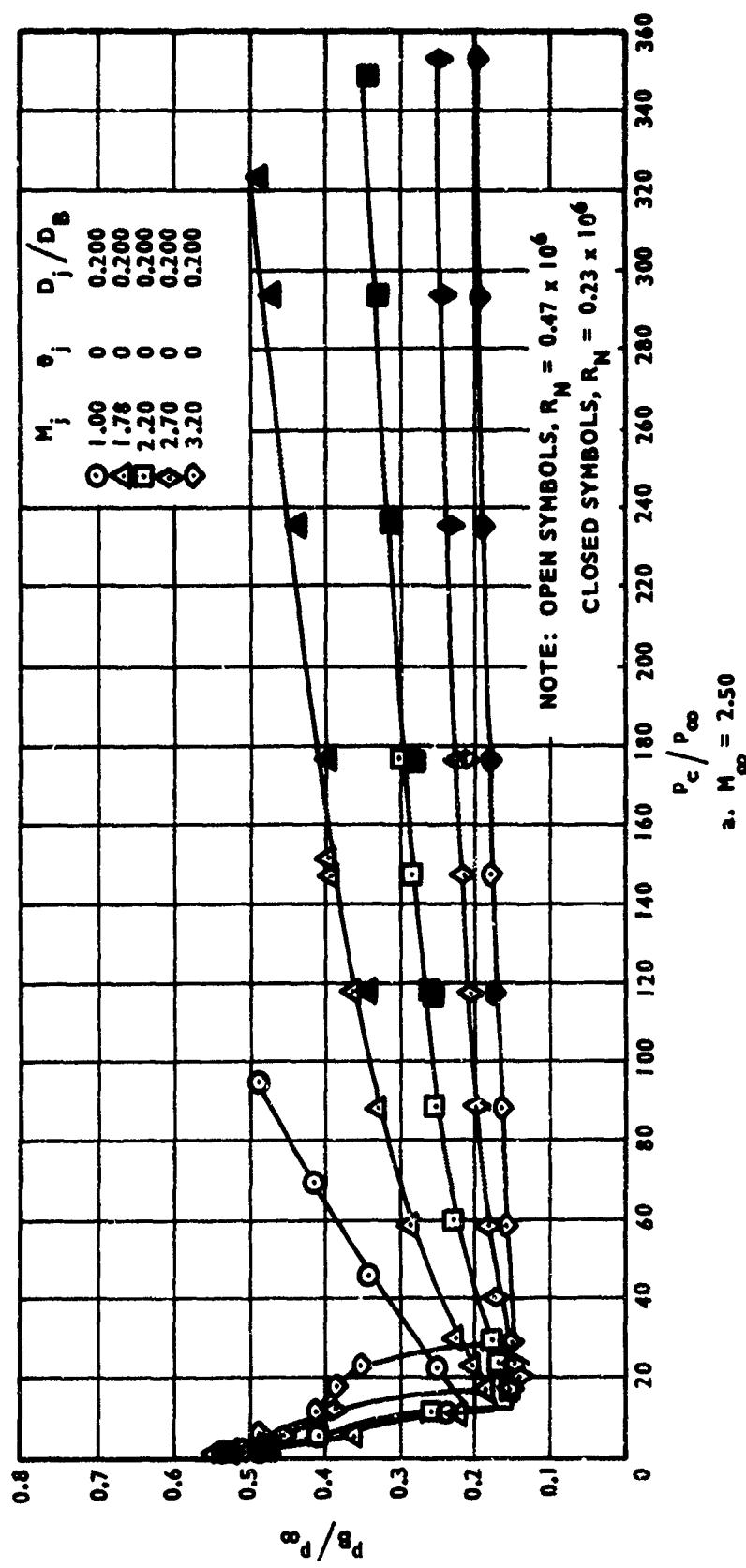


FIGURE 5. EFFECT OF JET MACH NUMBER ON BASE PRESSURE, CONTOURED NOZZLES,  
CONSTANT EXIT DIAMETER

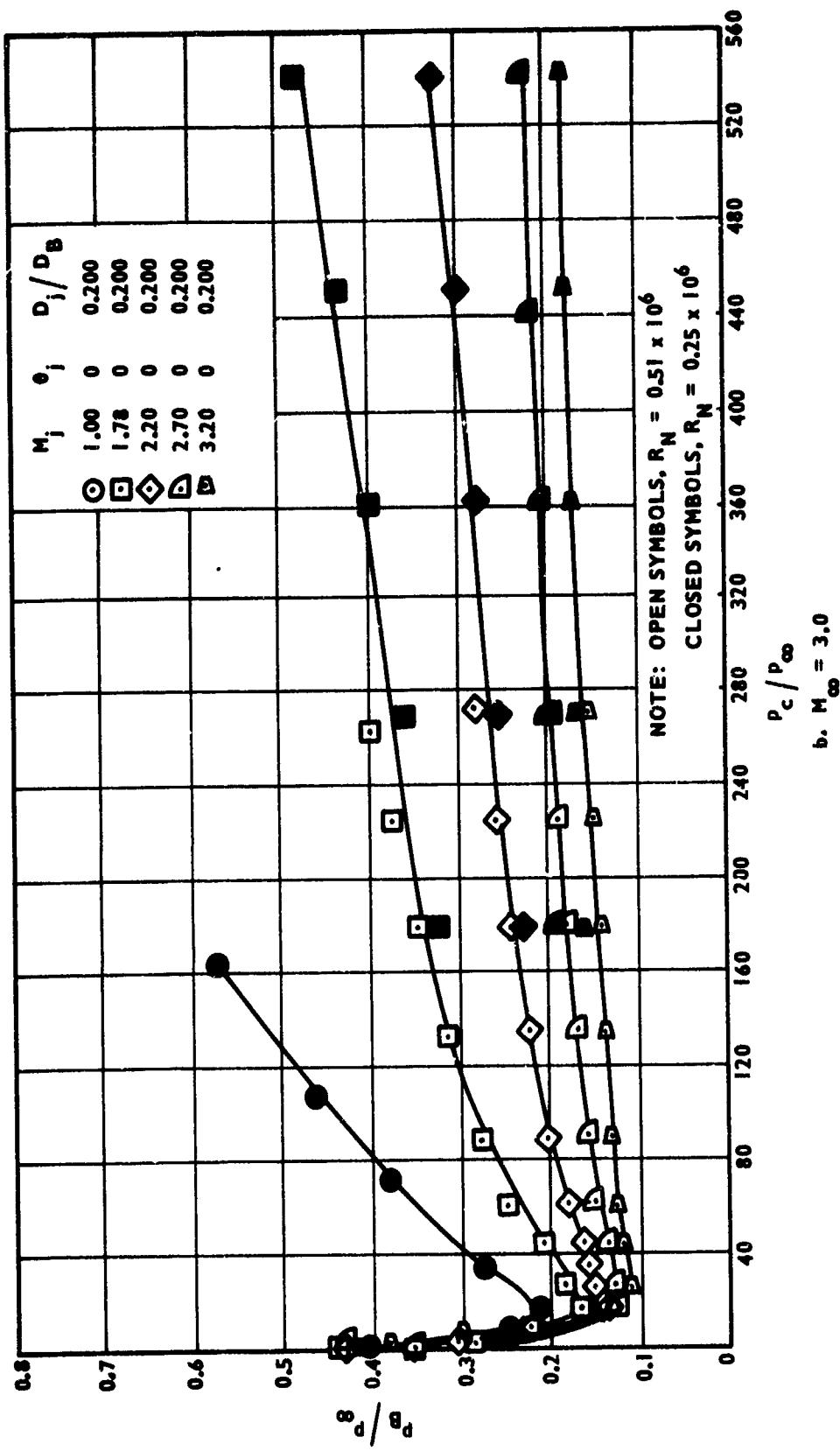


FIGURE 5. EFFECT OF JET MACH NUMBER ON BASE PRESSURE, CONTOURED NOZZLES,  
 CONSTANT EXIT DIAMETER (Concluded)

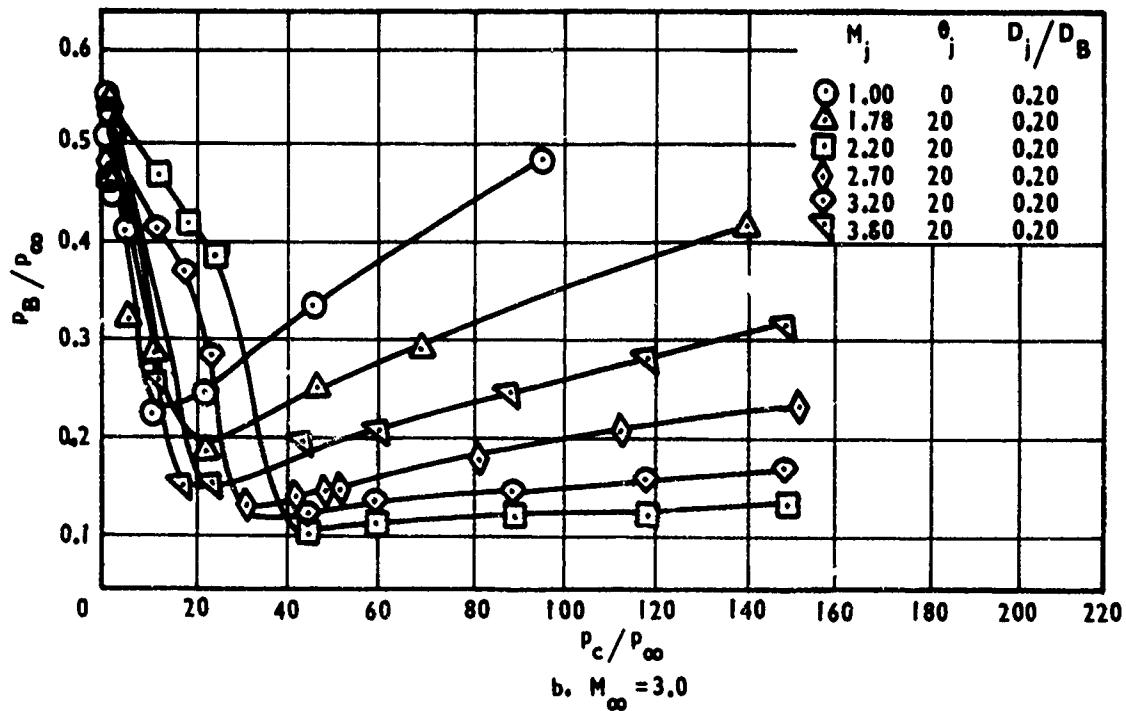
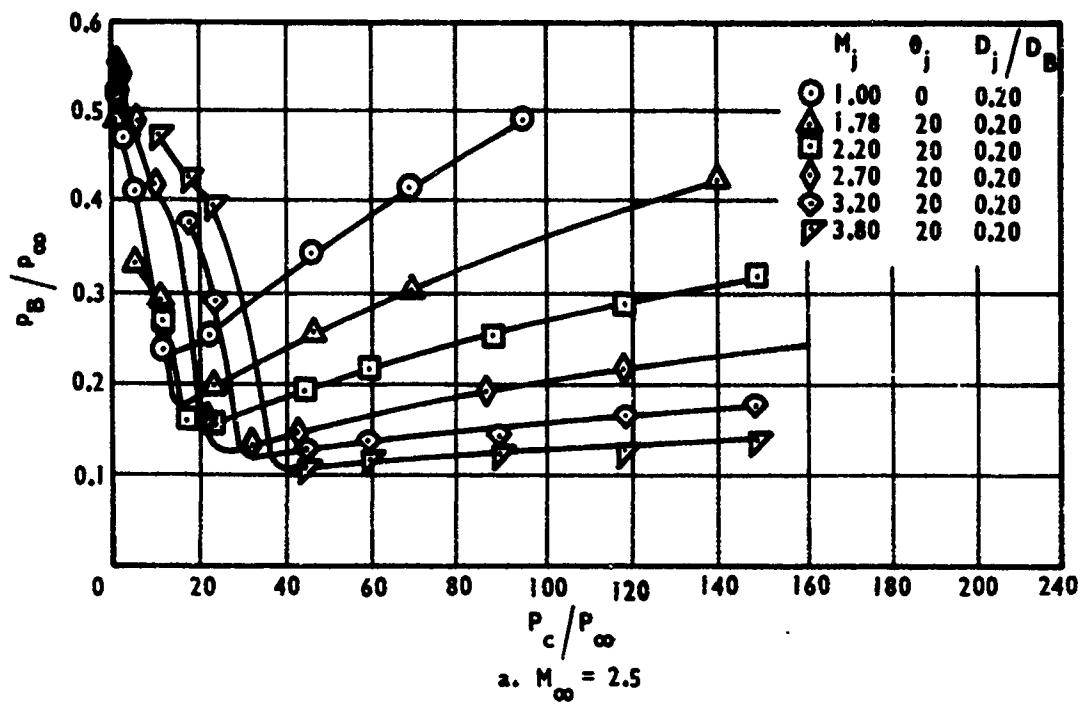


FIGURE 6. EFFECT OF JET MACH NUMBER ON BASE PRESSURE,  
CONICAL NOZZLES, CONSTANT EXIT DIAMETER

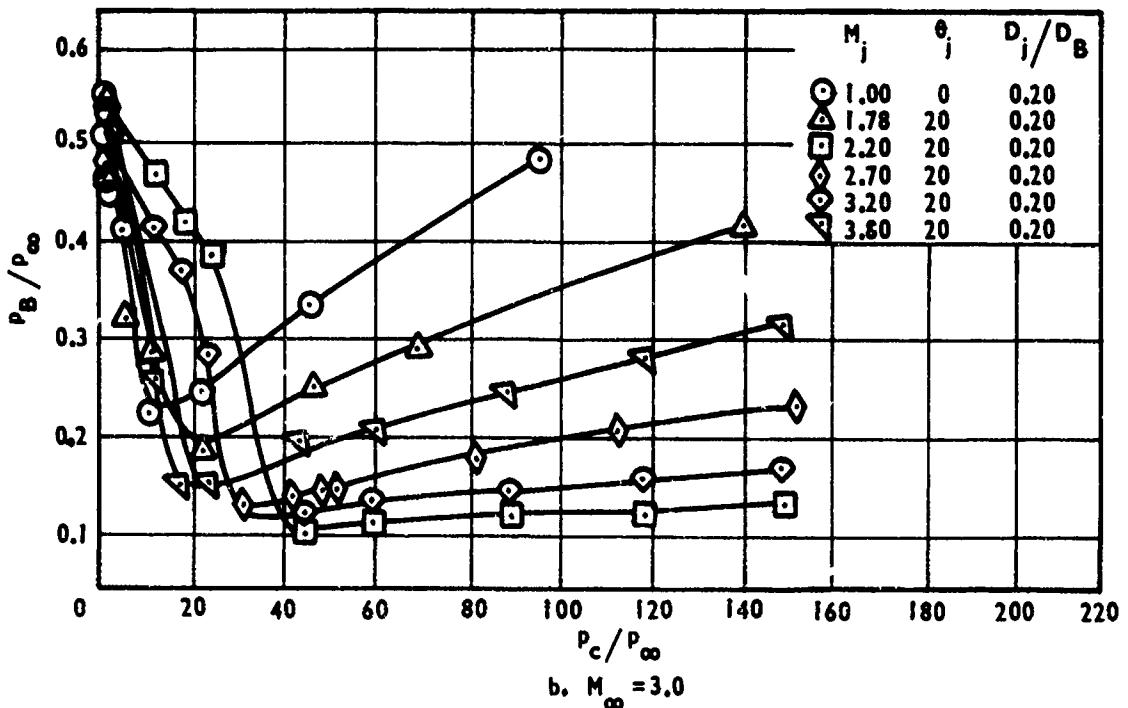
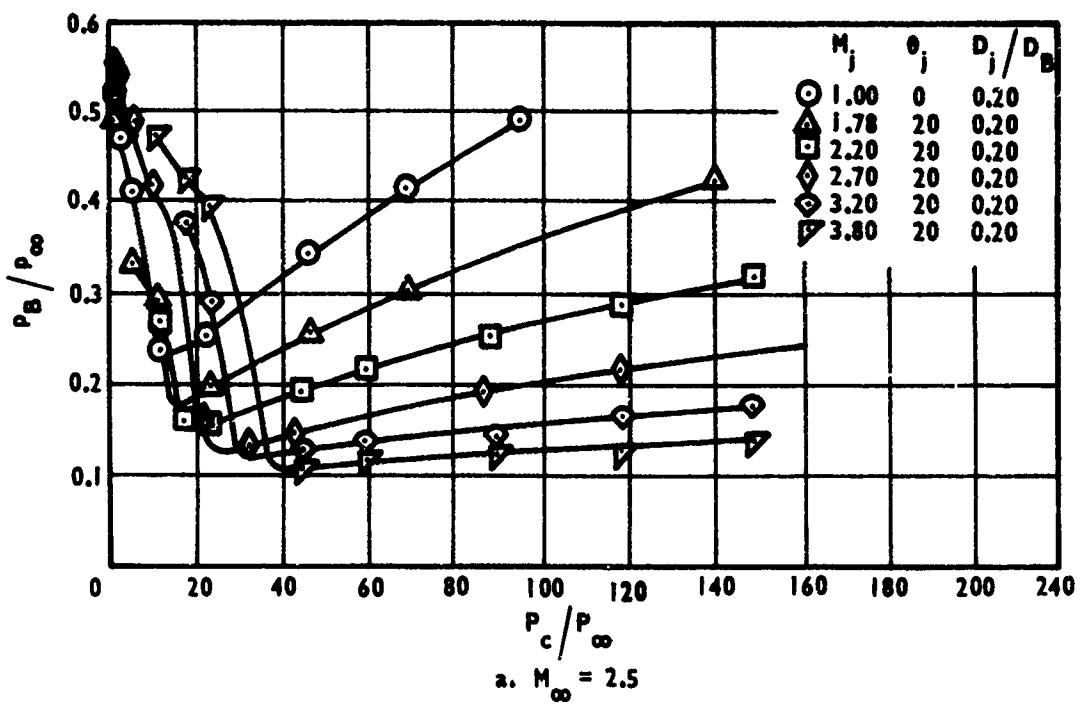


FIGURE 6. EFFECT OF JET MACH NUMBER ON BASE PRESSURE,  
CONICAL NOZZLES, CONSTANT EXIT DIAMETER

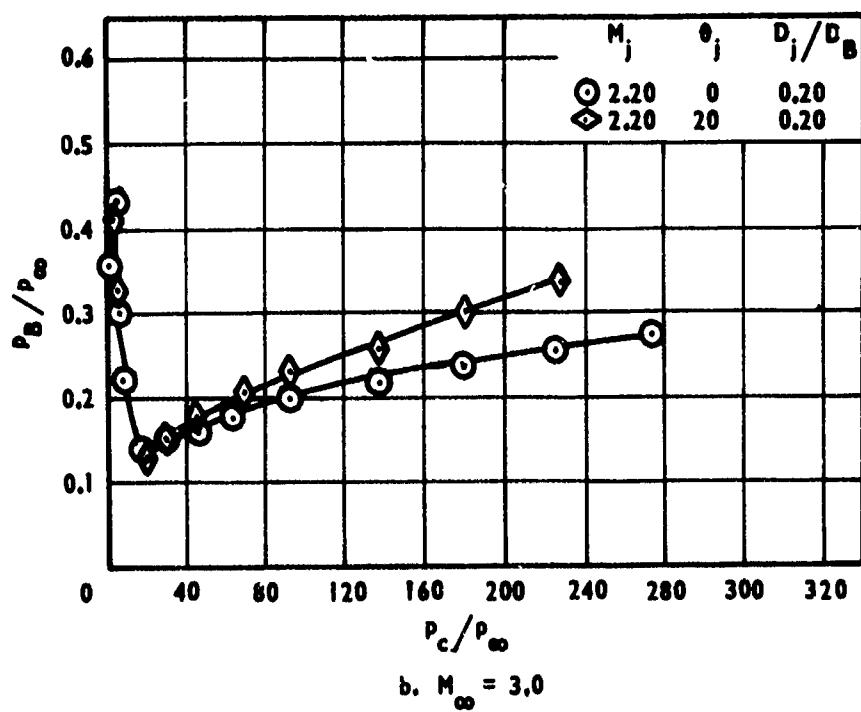
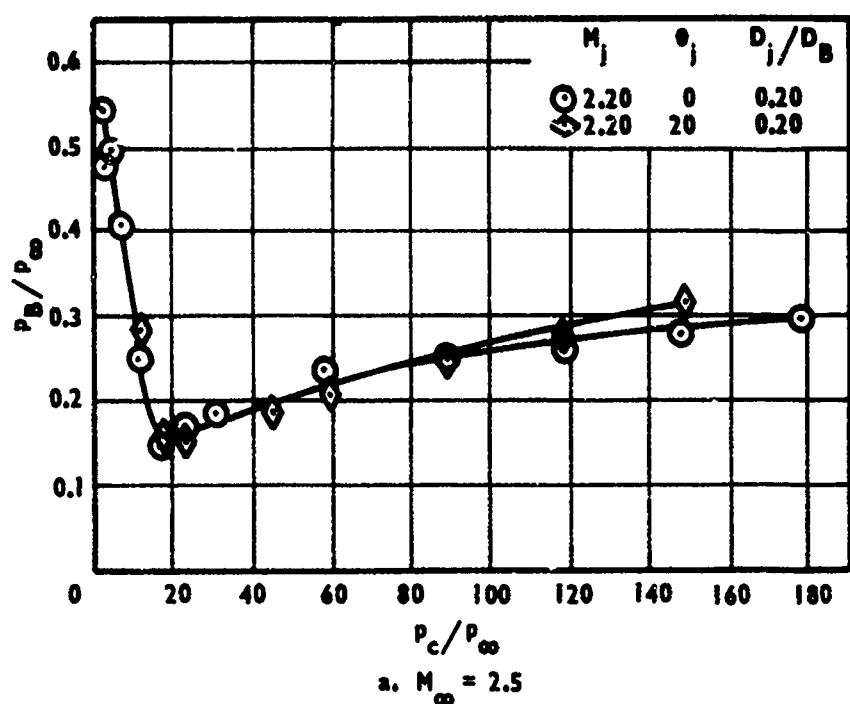
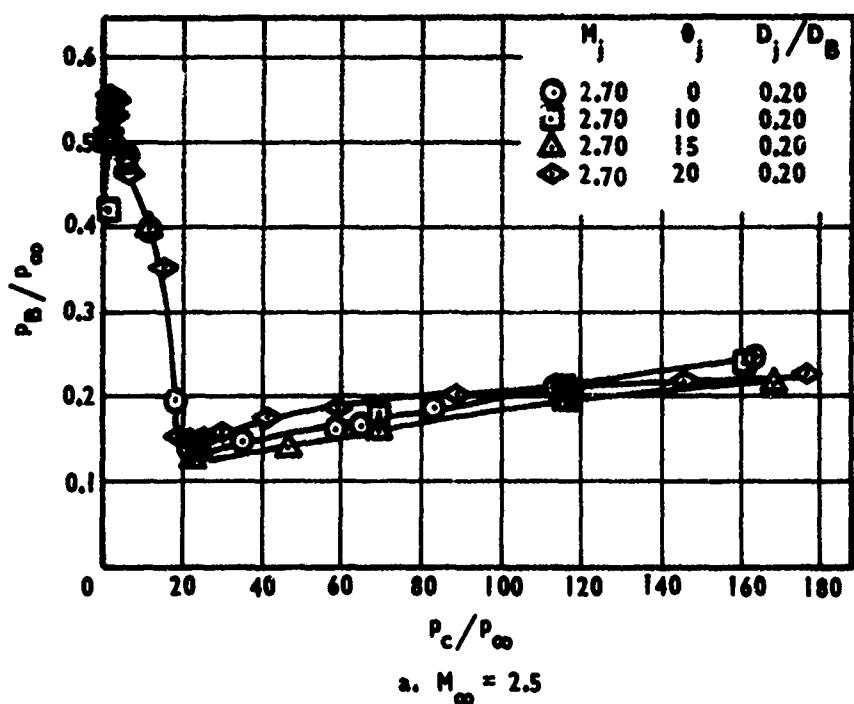
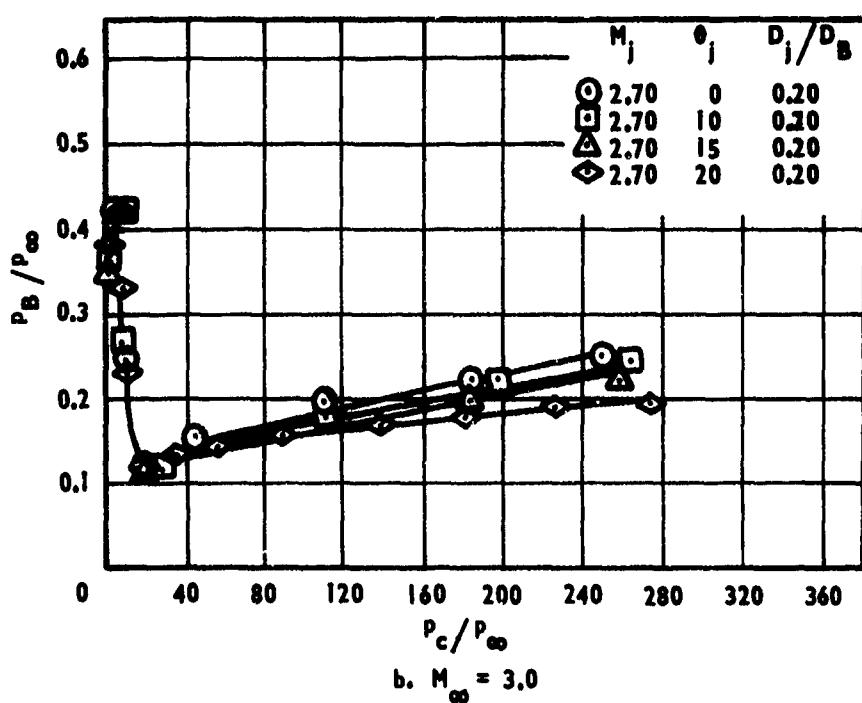


FIGURE 8. EFFECT OF NOZZLE ANGLE ON BASE PRESSURE,  
EXIT MACH NUMBER = 2.20



a.  $M_{\infty} = 2.5$



b.  $M_{\infty} = 3.0$

FIGURE 9. EFFECT OF NOZZLE ANGLE ON BASE PRESSURE,  
EXIT MACH NUMBER = 2.70

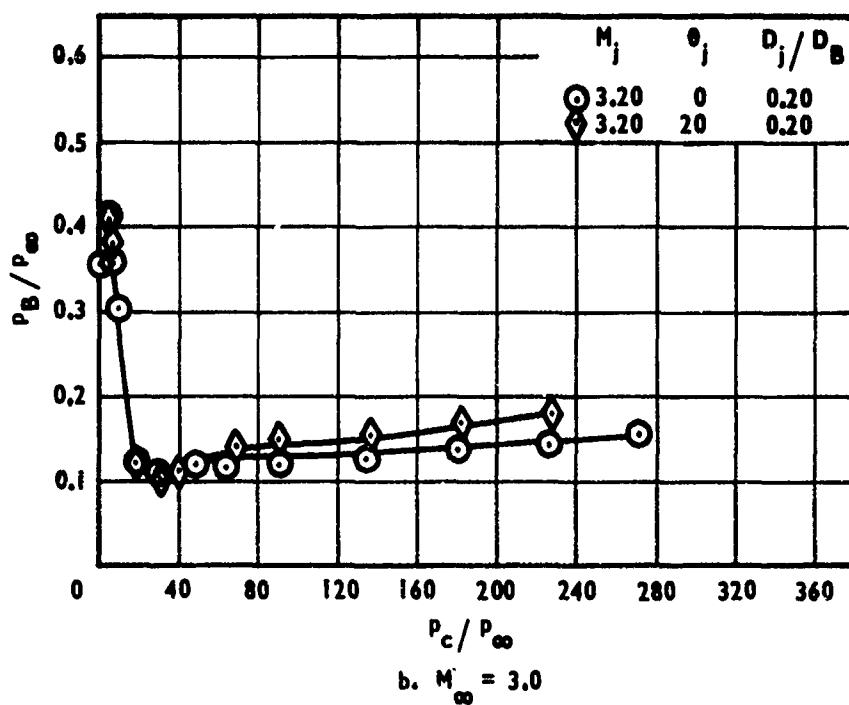
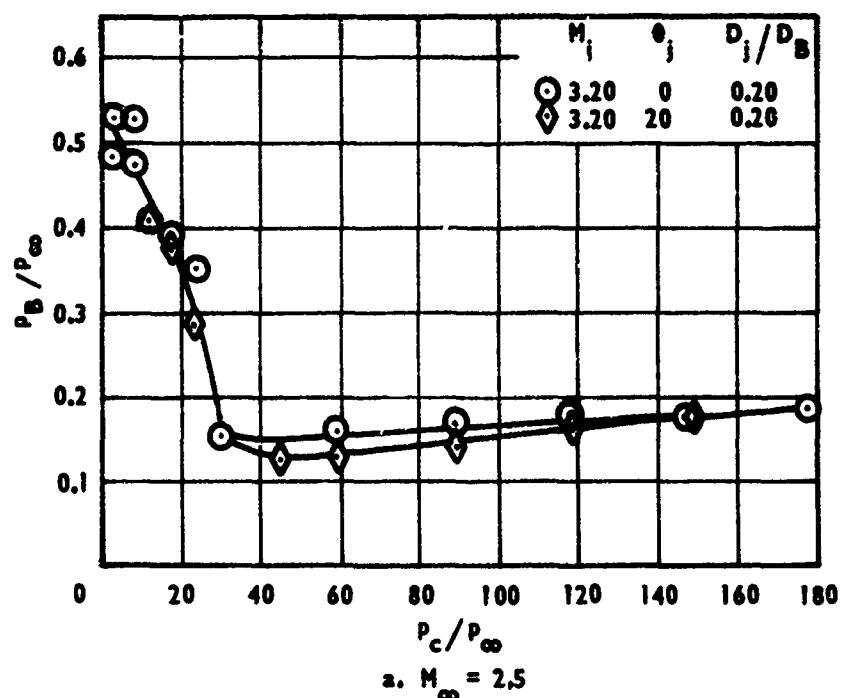


FIGURE 10. EFFECT OF NOZZLE ANGLE ON BASE PRESSURE,  
EXIT MACH NUMBER = 3.20

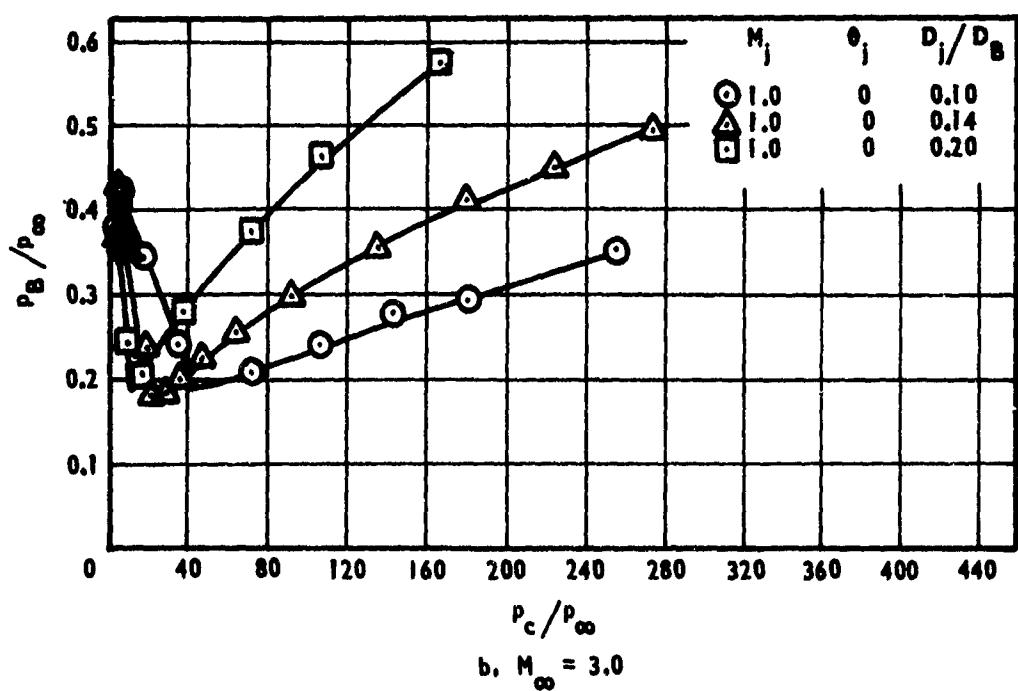
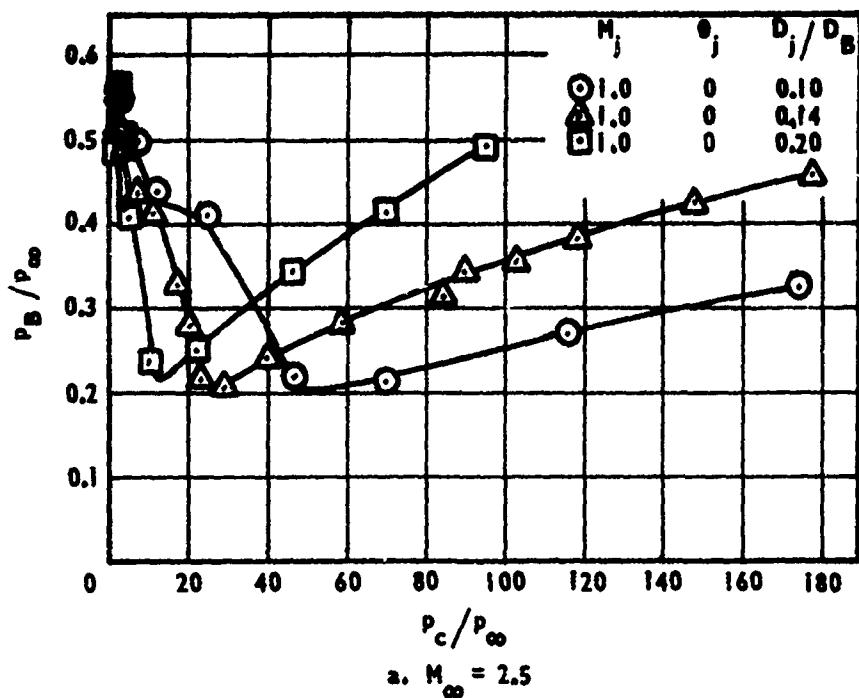


FIGURE 11. EFFECT OF NOZZLE DIAMETER ON BASE PRESSURE,  
EXIT MACH NUMBER = 1.00

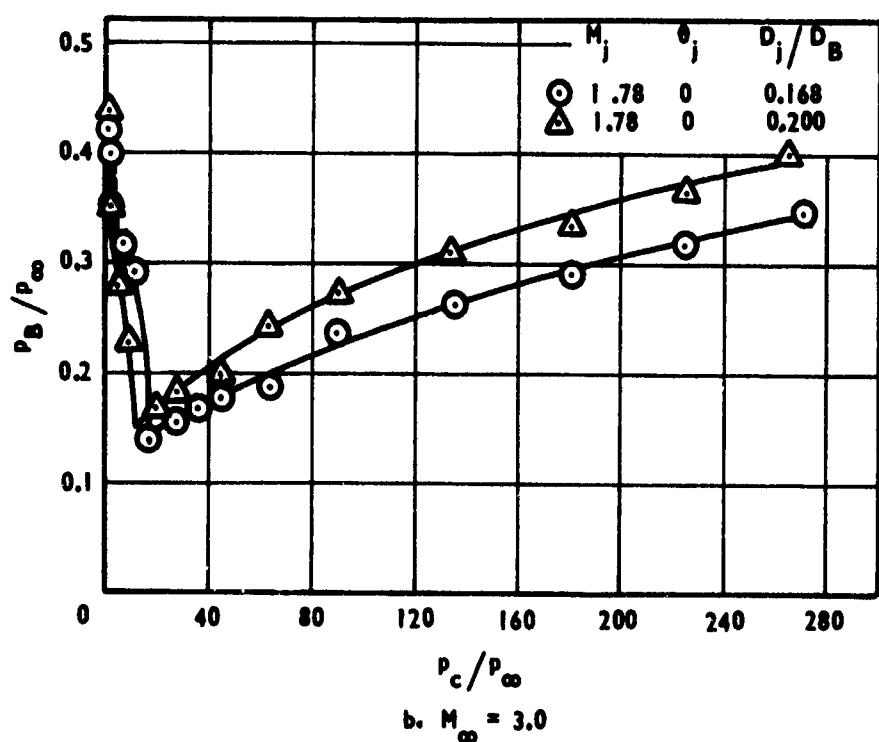
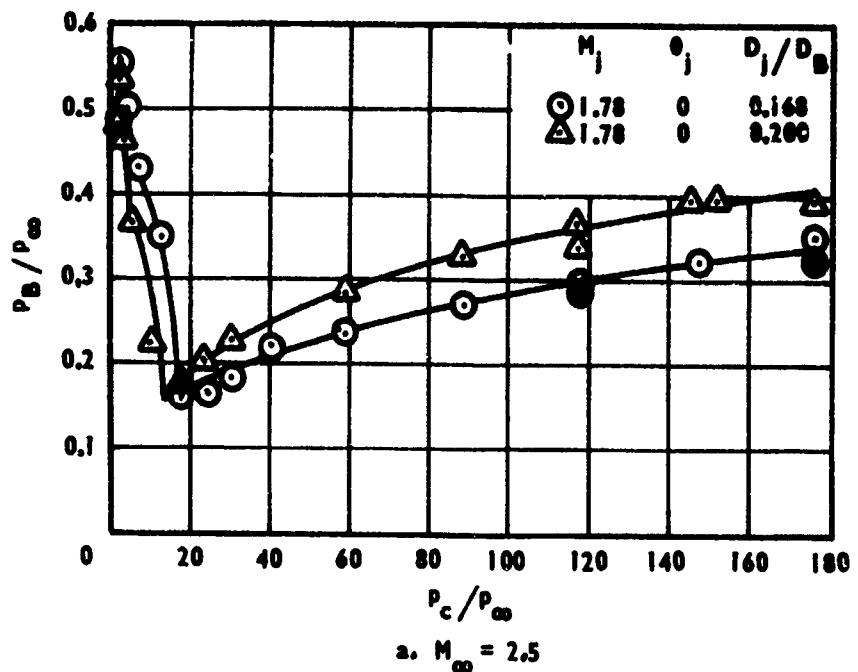


FIGURE 12. EFFECT OF NOZZLE DIAMETER ON BASE PRESSURE,  
EXIT MACH NUMBER = 1.78, CONTOURED NOZZLES

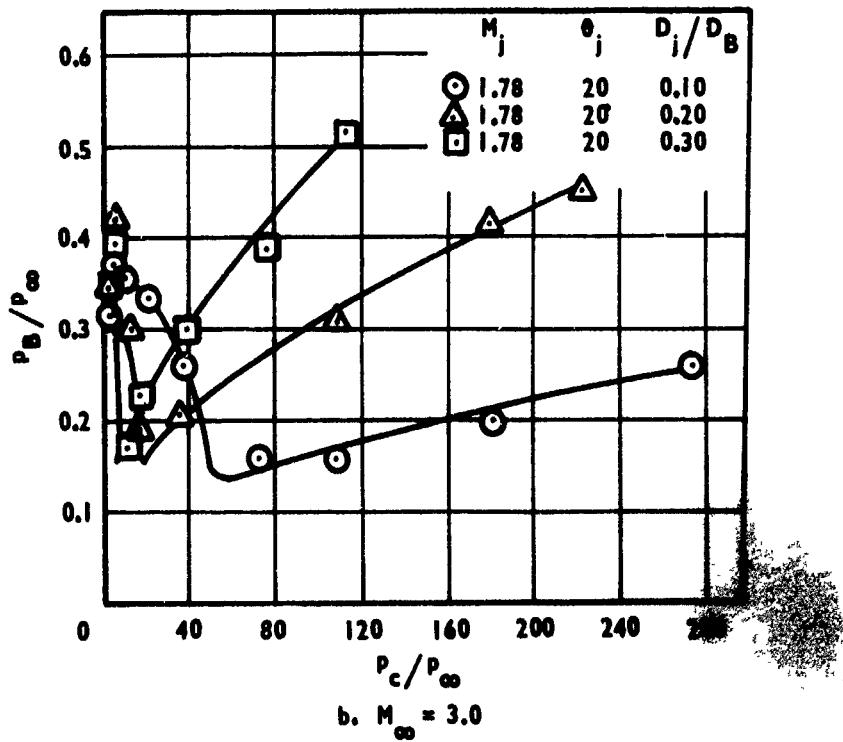
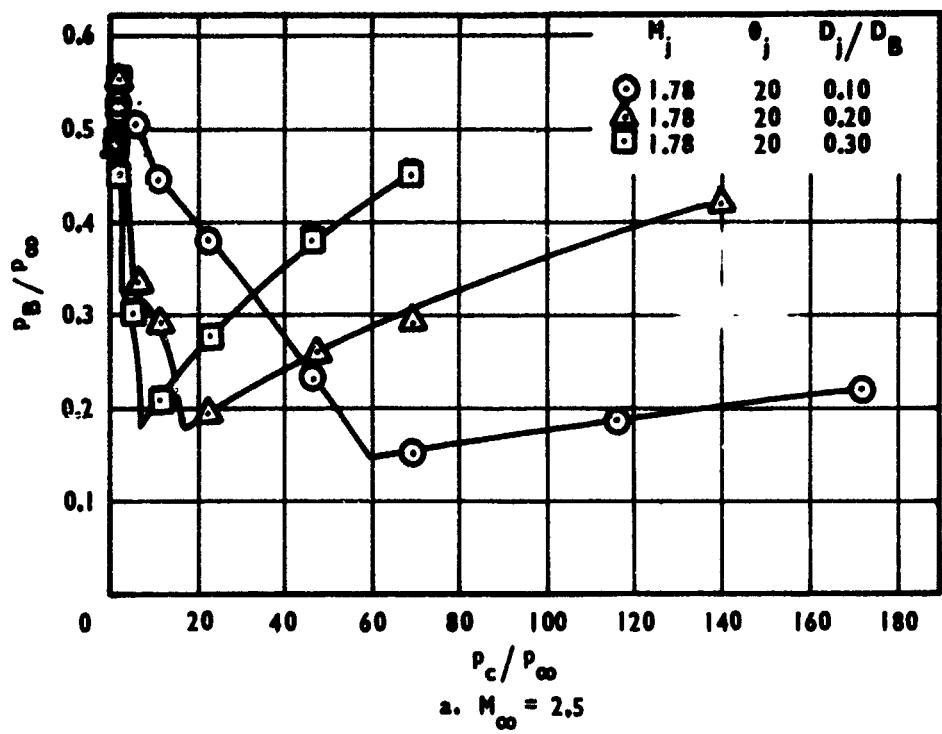


FIGURE 13. EFFECT OF NOZZLE DIAMETER ON BASE PRESSURE,  
EXIT MACH NUMBER = 1.78, CONICAL NOZZLES

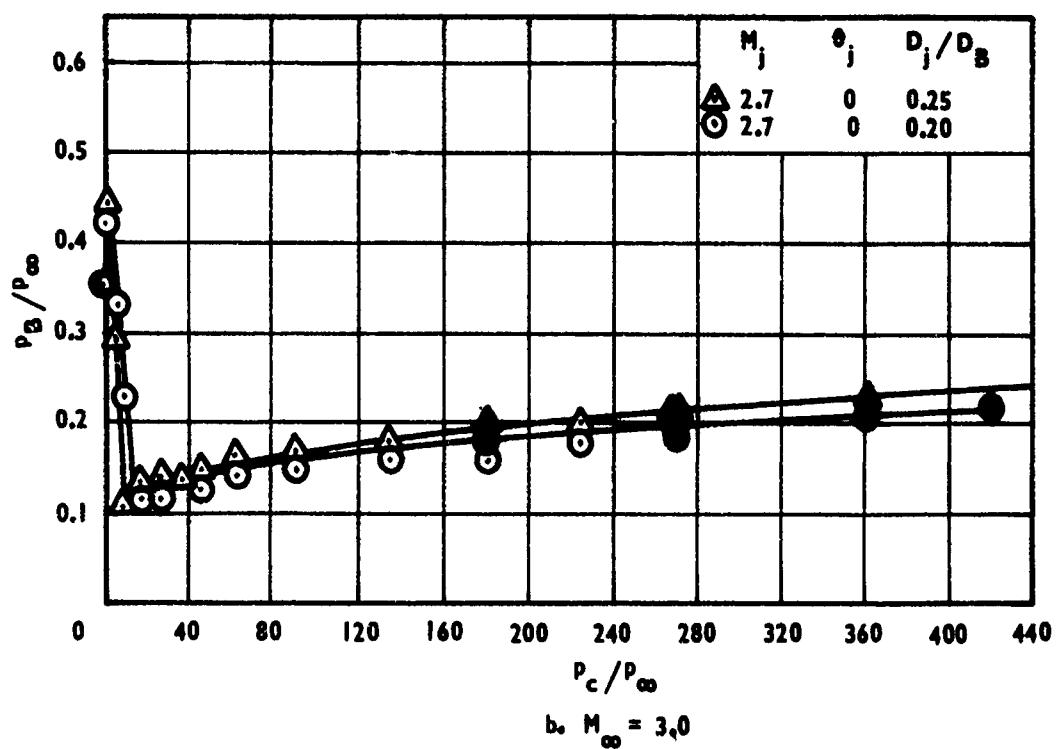
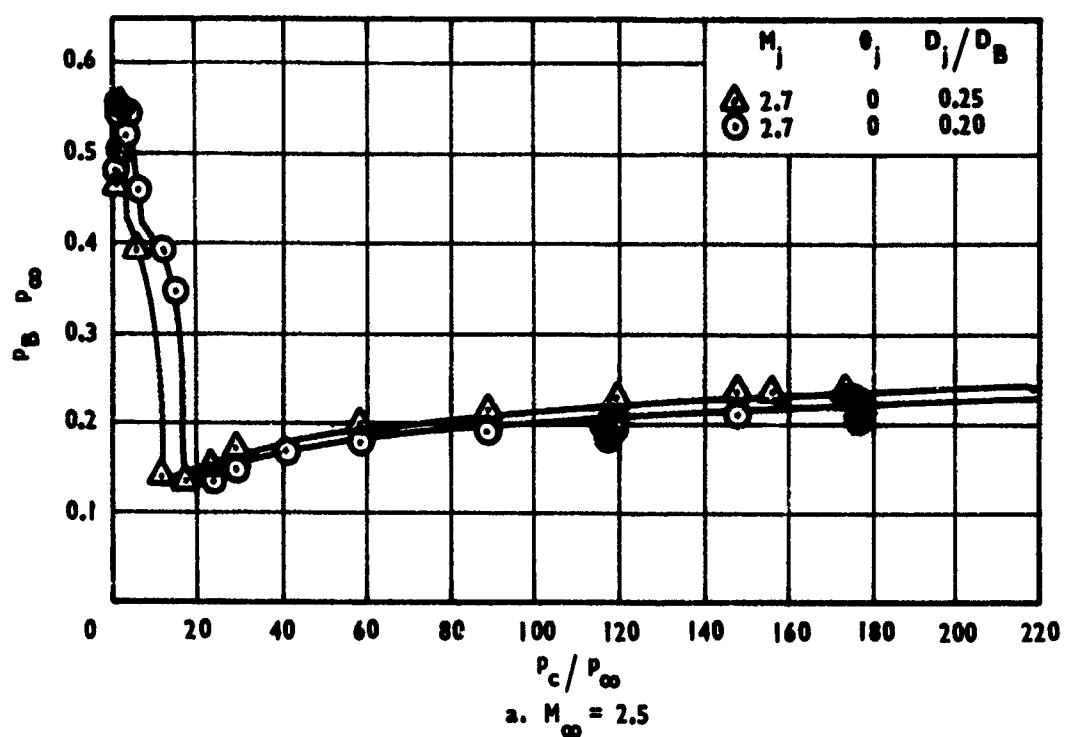


FIGURE 14. EFFECT OF NOZZLE DIAMETER ON BASE PRESSURE,  
EXIT MACH NUMBER = 2.70, CONTOURED NOZZLES

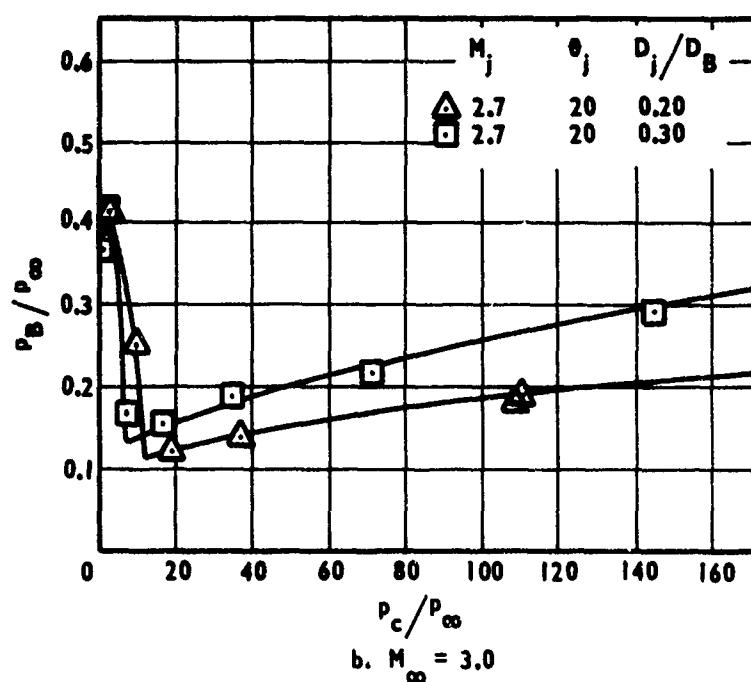
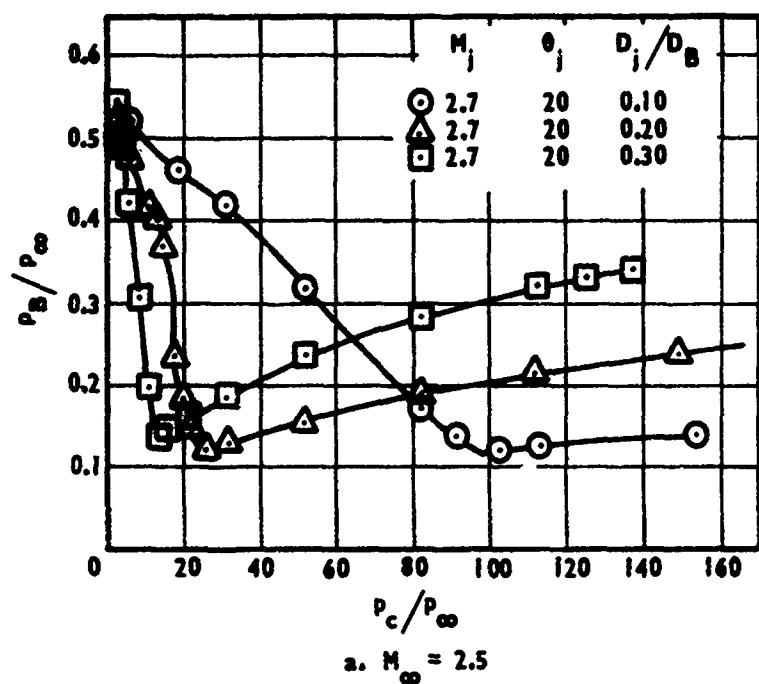


FIGURE 15. EFFECT OF NOZZLE DIAMETER ON BASE PRESSURE,  
EXIT MACH NUMBER = 2.70, CONICAL NOZZLES

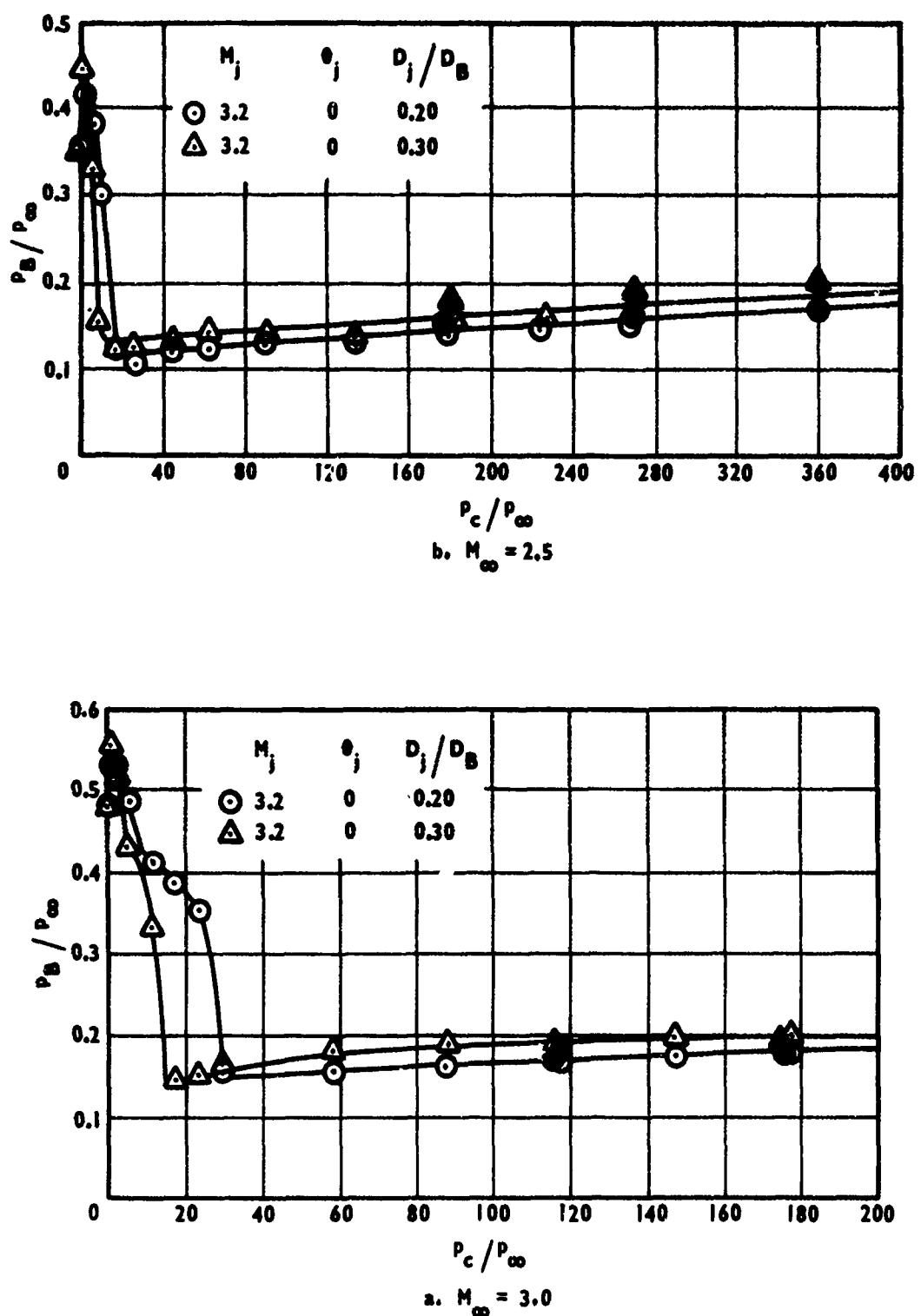


FIGURE 16. EFFECT OF NOZZLE DIAMETER ON BASE PRESSURE,  
EXIT MACH NUMBER = 3.20

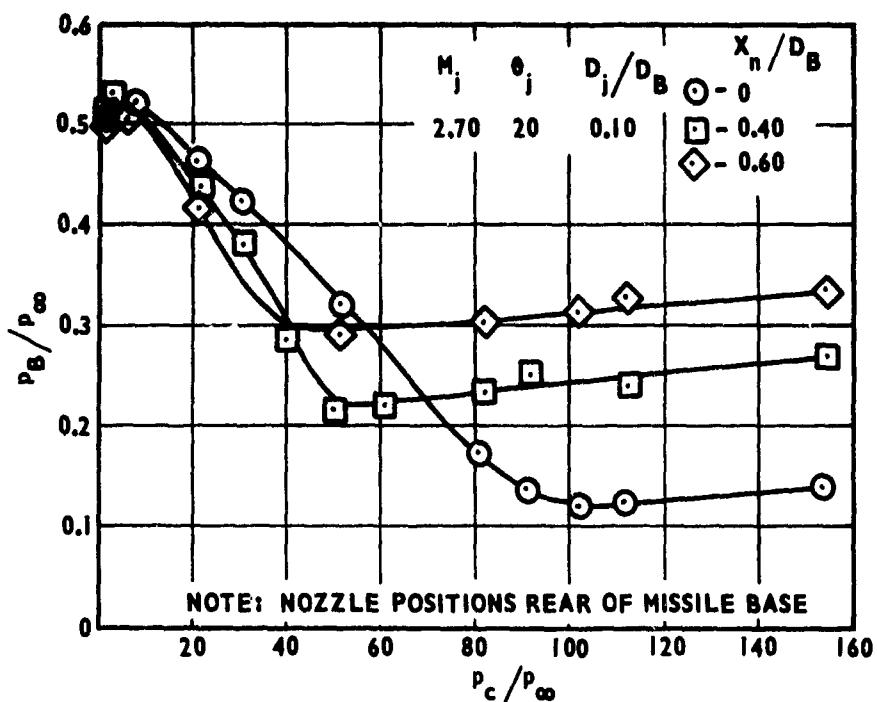
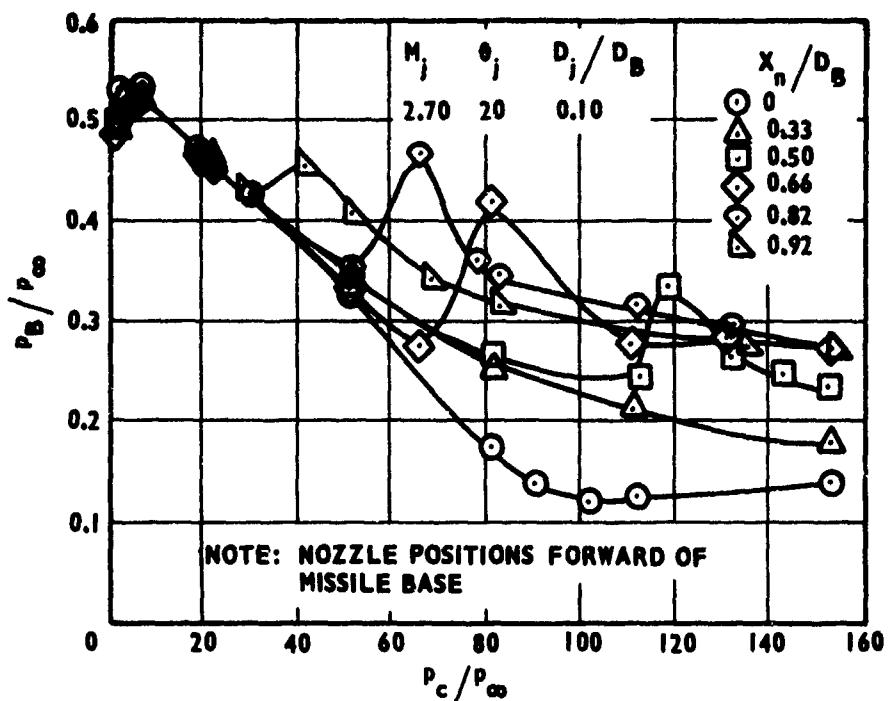


FIGURE 17. EFFECT OF NOZZLE POSITION ON BASE PRESSURE,  
NOZZLE-BASE RATIO = 0.10, MACH NUMBER = 2.50

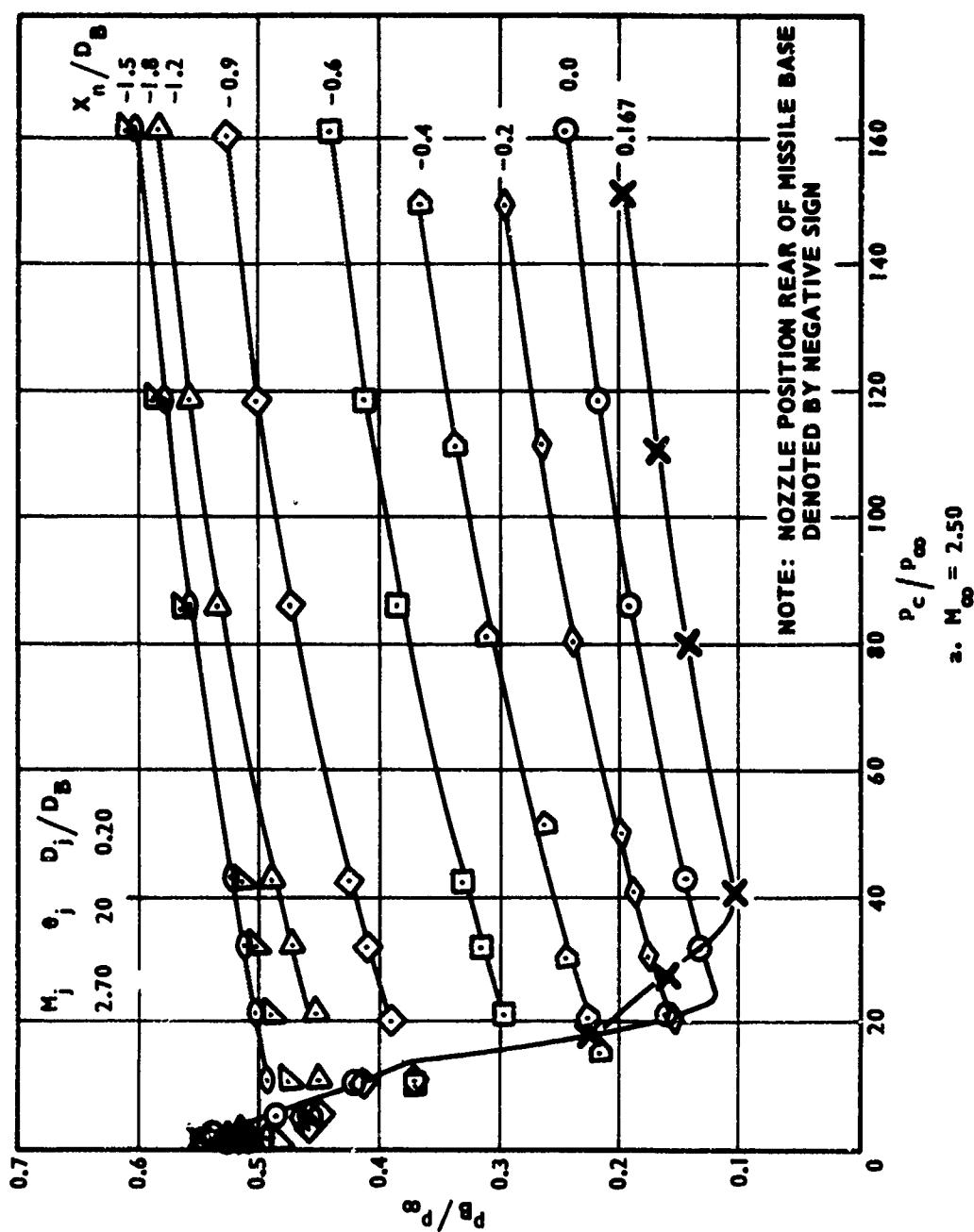


FIGURE 18. EFFECT OF NOZZLE POSITION ON BASE PRESSURE,  
NOZZLE-BASE RATIO = 0.20

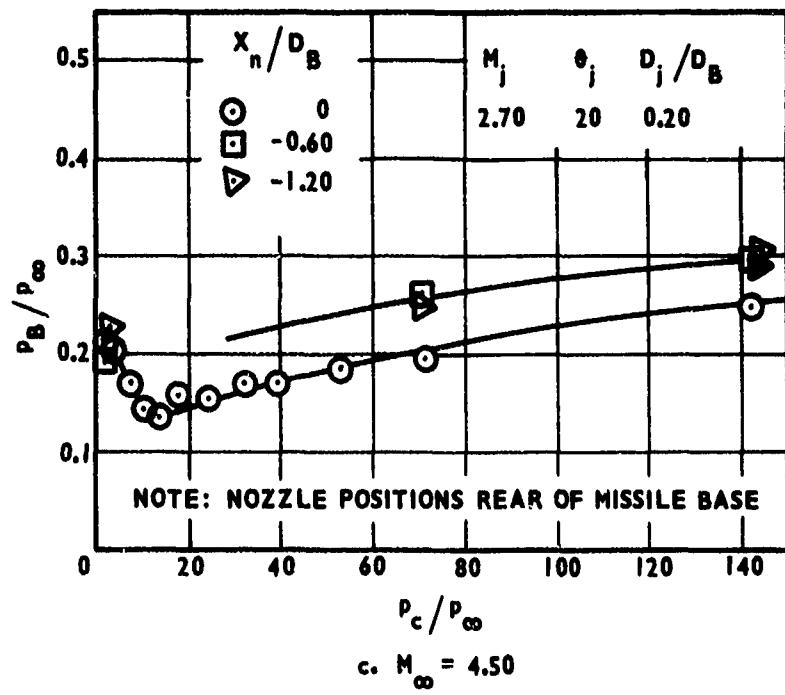
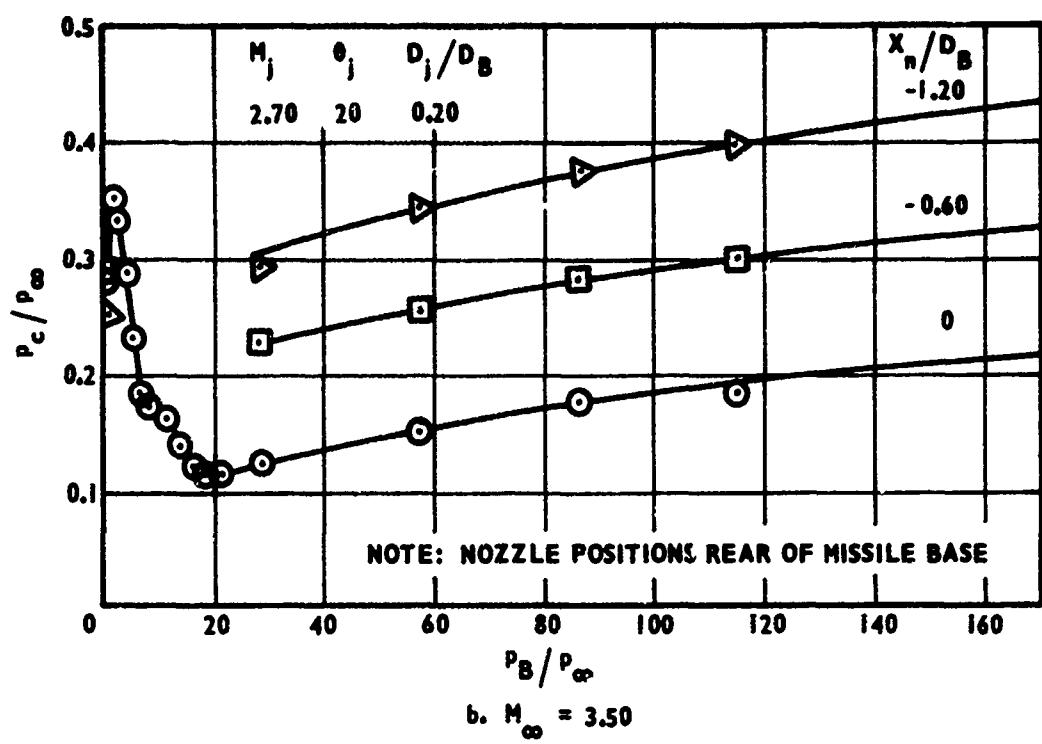


FIGURE 18. EFFECT OF NOZZLE POSITION ON BASE PRESSURE,  
NOZZLE-BASE RATIO = 0.20 (Concluded)

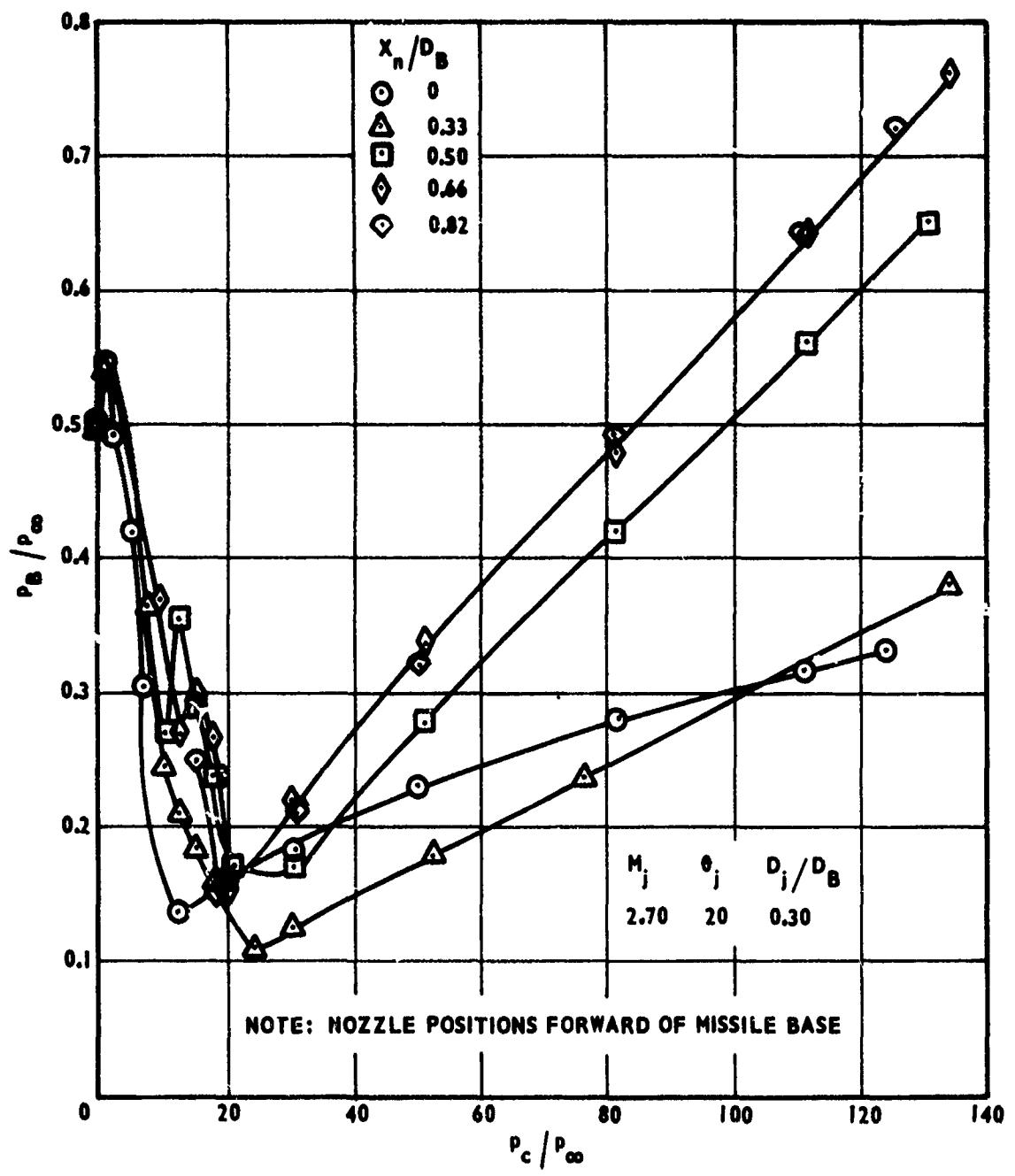


FIGURE 19. EFFECT OF NOZZLE POSITION ON BASE PRESSURE,  
NOZZLE-BASE RATIO = 0.30, MACH NUMBER = 2.50

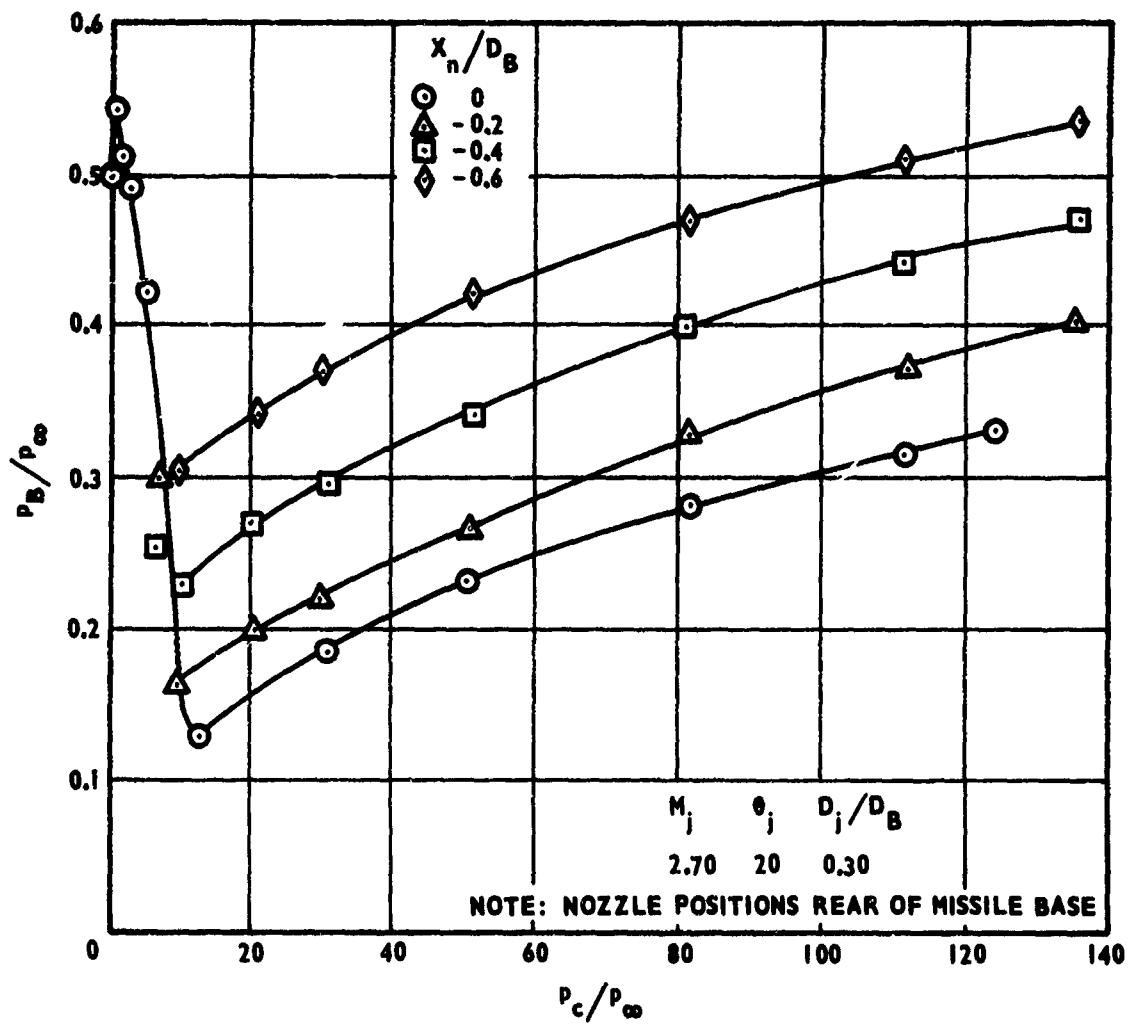


FIGURE 19. EFFECT OF NOZZLE POSITION ON BASE PRESSURE,  
NOZZLE-BASE RATIO = 0.30, MACH NUMBER = 2.50

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**Appendix**  
**Tabulated Test Results**

The following data were listed from computer equipment and the symbols used to designate various parameters were selected to facilitate the use of this equipment. The following list identifies the symbols used in this portion of the report:

CPB	Base pressure coefficient, $\left[ \frac{PB}{PF} - 1.0 \right] \frac{1.0}{0.7 (MF)^2}$
CT	Thrust coefficient, thrust/[dynamic pressure $\times$ reference area]
D*	Diameter of nozzle at the throat (in.)
DJ	Diameter of nozzle at the exit plane (in.)
DB	Reference diameter of body, 2.50 in.
GJ	Jet specific heat ratio
L	Model length (in.)
MF	Free stream Mach number
MJ	Jet exit Mach number
PB	Mean base pressure (psia)
PC	Jet stagnation pressure (psia)
PF	Free stream static pressure (psia)
RMF	Jet momentum flux ratio, $\frac{(PJ)(AJ)(MJ)^2}{(PF)(AB)(MF)^2}$ , where $AJ = \pi \bar{D}_J^2$ , $AB = \pi \bar{D}_B^2$ , and $PJ$ = jet static pressure
THEJ	Divergence half-angle of nozzles (deg)
TOF	Free stream static temperature ( $^{\circ}$ F)
RN	Reynolds number per inch
XJ	Location of nozzle exit plane relative to model base (in.) (negative positions rear of model base)

The data are arranged according to the index given in Tables A-I through A-III.

TABLE A-I. INDEX TO TABULATED DATA

Group	$M_j$	$\theta_j$	$D_j/D_B$	$M_\infty$	$R_N \times 10^{-6}$
1A	1.0	0	0.10	2.50	0.47
	1.0	0	0.10	3.00	0.51
	1.0	0	0.14	2.50	0.23
	1.0	0	0.14	2.50	0.47
	1.0	0	0.14	3.00	0.25
	1.0	0	0.14	3.00	0.51
1B	1.0	0	0.20	2.50	0.47
	1.0	0	0.20	3.00	0.51
	1.0	0	0.20	3.00	0.47
	1.0	0	0.20	3.00	0.51
	1.0	0	0.20	3.00	0.47
	1.0	0	0.20	3.00	0.51
1C	1.78	0	0.16	2.50	0.23
	1.78	0	0.16	2.50	0.47
	1.78	0	0.16	3.00	0.25
	1.78	0	0.16	3.00	0.51
	1.78	0	0.20	2.50	0.23
	1.78	0	0.20	3.00	0.47
2A	1.78	0	0.20	2.50	0.23
	1.78	0	0.20	2.50	0.47
	1.78	0	0.20	3.00	0.25
	1.78	0	0.20	3.00	0.51
	1.78	0	0.20	3.00	0.47
	1.78	5	0.20	2.50	0.47
2B	1.78	5	0.20	3.00	0.51
	1.78	20	0.10	2.50	0.47
	1.78	20	0.10	3.00	0.51
	1.78	20	0.20	2.50	0.47
	1.78	20	0.20	3.00	0.25
	1.78	20	0.20	3.00	0.51
2C	1.78	20	0.20	2.50	0.47
	1.78	20	0.20	3.00	0.51
	1.78	20	0.30	2.50	0.47
	1.78	20	0.30	3.00	0.51
	1.78	20	0.30	2.50	0.47
	1.78	20	0.30	3.00	0.51
2D	1.78	20	0.10	2.50	0.47
	1.78	20	0.10	3.00	0.51
	1.78	20	0.20	2.50	0.47
	1.78	20	0.20	3.00	0.51
	1.78	20	0.20	2.50	0.47
	1.78	20	0.20	3.00	0.51
2E	1.78	20	0.20	2.50	0.47
	1.78	20	0.20	3.00	0.51
	1.78	20	0.30	2.50	0.47
	1.78	20	0.30	3.00	0.51
	1.78	20	0.30	2.50	0.47
	1.78	20	0.30	3.00	0.51
2F	1.78	20	0.20	2.50	0.47
	1.78	20	0.20	3.00	0.51
	1.78	20	0.30	2.50	0.47
	1.78	20	0.30	3.00	0.51
	1.78	20	0.30	2.50	0.47
	1.78	20	0.30	3.00	0.51
3A	2.20	0	0.20	2.50	0.23
	2.20	0	0.20	2.50	0.47
	2.20	0	0.20	3.00	0.25
	2.20	0	0.20	3.00	0.51
	2.20	20	0.20	2.50	0.47
	2.20	20	0.20	3.00	0.51
3B	2.20	20	0.20	2.50	0.47
	2.20	20	0.20	3.00	0.51
	2.70	0	0.20	2.50	0.23
	2.70	0	0.20	2.50	0.51
	2.70	0	0.20	3.00	0.25
	2.70	0	0.20	3.00	0.51
4A	2.70	0	0.20	2.50	0.23
	2.70	0	0.20	2.50	0.51
	2.70	0	0.20	3.00	0.25
	2.70	0	0.20	3.00	0.51
	2.70	0	0.20	3.00	0.47
	2.70	0	0.20	3.00	0.51

TABLE A-I. INDEX TO TABULATED DATA (Concluded)

Group	$M_j$	$\theta_j$	$D_j/D_B$	$M_\infty$	$R_N \times 10^{-6}$
4B	2.70	0	0.25	2.50	0.23
	2.70	0	0.25	2.50	0.47
	2.70	0	0.25	3.00	0.25
	2.70	0	0.25	3.00	0.51
4C	2.70	10	0.20	2.50	0.47
	2.70	10	0.20	3.00	0.51
4D	2.70	15	0.20	2.50	0.47
	2.70	15	0.20	3.00	0.51
4E	2.70	20	0.20	2.50	0.47
	2.70	20	0.20	3.00	0.54
	2.70	20	0.20	3.50	0.50
	2.70	20	0.20	4.00	0.50
4F	2.70	20	0.20	4.50	0.49
	2.70	20	0.30	2.50	0.54
5A	3.20	0	0.20	2.50	0.23
	3.20	0	0.20	2.50	0.47
	3.20	0	0.20	3.00	0.25
5B	3.20	0	0.20	3.00	0.51
	3.20	0	0.31	2.50	0.23
	3.20	0	0.31	2.50	0.47
	3.20	0	0.31	3.00	0.25
5C	3.20	20	0.20	3.00	0.51
	3.20	20	0.20	2.50	0.47
6A	3.80	20	0.20	3.00	0.50
	3.80	20	0.20	2.50	0.47

TABLE A-II. NOZZLE POSITION DATA

Group	$M_j$	$\theta_j$	$D_j/D_B$	$M_\infty$	$R_N$ (in.)	$X_N$	$D_B$
7A	2.70	20	0.10	2.50	$0.55 \times 10^6$	-0.60	
						-0.40	
						0	
						0.33	
						0.50	
						0.67	
7B	2.70	20	0.20	2.50	$0.55 \times 10^6$	0.82	
						0.98	
						-0.60	
						-0.40	
						-0.20	
						0	
7C	2.70	20	0.30	2.50	$0.50 \times 10^6$	0.33	
						0.50	
						0.67	
						0.82	
						0.98	
						-0.60	
				3.50	$0.49 \times 10^6$	-1.20	
						-0.60	
						-1.20	
						-0.60	
						-0.40	
						-0.20	
				4.50	$0.49 \times 10^6$	0	
						0.33	
						0.50	
						0.67	
						0.82	

TABLE A-III. REYNOLDS NUMBER DATA

Group	$M_j$	$\theta_j$	$D_j/D_B$	$M_\infty$	$R_N$ (in.)
6A	2.70	0	0.25	2.50	$0.12 \times 10^6$
8B	1.00	0	0.056	2.50	$0.23 \times 10^6$
					$0.35 \times 10^6$
					$0.47 \times 10^6$
					$0.12 \times 10^6$
					$0.23 \times 10^6$
					$0.35 \times 10^6$
					$0.47 \times 10^6$

GROUP 1A									
MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	MJ	THEJ	D*	XJ/DB
1.00	0.30	.25	.25	.25	0.00	1.00	0.00	.25	0.00
2.50	101.20	1.73	1.40	1.40	1.40	3.00	130.30	1.11	1.40
PC/PF	P8/PF	CPB	RMF	CT	TC	PC/PF	P8/PF	CPB	RMF
1.15	.5416	-.1071	.0005*	-.001*	.6300	.38	-.1011	.0001*	CT
1.73	.5378	-.1080	.0010	.002	.6300	1.81	-.0931	.0010	TC
5.50	.4966	-.1176	.0040	.013	.5200	9.14	-.1028	.0050	60.00
11.17	.4289	-.1335	.0090	.030	.6300	18.05	-.1039	.0100	60.00
23.00	.4263	-.1387	.0190	.064	.6300	35.94	-.1049	.034	60.00
46.08	.4182	-.1831	.0380	.131	.6300	72.53	-.1208	.070	50.00
69.71	.2155	-.1702	.0580	.199	.6300	107.43	-.1241	.0420	60.00
115.88	.2694	-.1702	.0970	.3333	.6300	180.33	-.1243	.0630	60.00
173.62	.3238	-.1587	.1460	.500	.6300	295.85	-.1127	.1050	60.00
						350.3	-.1127	.1050	51.13
						350.3	-.1040	.1050	28.89
						350.3	-.1163	.1050	60.00
						144.55	-.1206	.1050	60.00

	MJ	THEJ	D*	DJ	XJ/DB	MJ	THEJ	D*	DJ	DJ/DB	XJ/DB
	0..20	.35	.35	.14	0..00	1..00	0..00	.35	.35	.14	0..00
	MF	TOF	PF	GJ	LENGTH	RF/IN	MF	TOF	PF	LENGTH	RF/IN
	2..50	93..70	1..69	1..40	15..0	.47	2..50	93..00	.85	15..0	.23
PB/PF		CPB	RMF	TC	PC/OF	PB/PF	CPB	RMF	CT	TC	
.49	*4856	*0.175	*0.004*	*0.03*	60..00		*1195	*4767	*001*	60..00	
.58	*5195	*0.198	*0.005*	*0.03*	60..00		117..29	*3729	*1633	*669	60..00
1..17	*5496	*0.129	*0.010	*0.02	60..00		175..88	*4434	*1272	*005	60..00
1..76	*5394	*0.153	*0.020	*0.05	60..00		234..58	*5075	*1125	*3910	60..00
2..94	*5034	*0.134	*0.040	*0.12	60..00		293..05	*5610	*1003	*4910	60..00
5..86	*4278	*1..307	*0.090	*0.29	60..00					1..679	60..00
11..74	*4160	*1..334	*0.190	*0.62	60..00					1..992	60..00
17..60	*3393	*0..1510	*0.290	*0.96	60..00						
20..65	*2899	*1..643	*0.340	*1..14	60..00						
23..54	*2257	*1..769	*0.390	*1..30	60..00						
29..39	*2089	*1..608	*0.490	*1..64	60..00						
		*2399	*1..737	*0.680							
		58..31	*2822	*0.970							
		84..99	*3289	*1..533							
		88..39	*3359	*1..517							
		123..30	*3585	*1..466							
		111..79	*3801	*1..416							
		1..32	*4225	*1..319							
		17..80	*4553	*1..244							

**GROUP 1B (Concluded)**

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	MJ	THEJ	D*	DJ	DJ/DB
1.00	0.00	.35	.35	*.14	0.00	1.00	.200	.15	.14	0.00
MF	TDF	PF	GJ	LENGTH	RN/IN	MF	TDF	GJ	LFNGTH	RN/IN
3.00	93.00	1.10	1.40	15.0	.51	3.00	93.00	.55	1.40	.25
PC/PF	PB/PF	CFB	RMF	CT	TC	PC/PF	PB/PF	CPR	RMF	CT
.37	.3548	-.1023	.0002*	~.002*	60.00	.4198	-.0920	.716	60.00	
*.90	.4232	-.0915	.0010	0.000	60.00	.4797	-.0826	.3140	1.073	
1.81	.4056	-.0943	.0030	.005	60.00	.5593	-.0713	.4190	1.424	
2.71	.3852	-.0975	.0040	.011	60.00	.50.83	-.0610	.5200	1.795	
4.53	.3525	-.1027	.0070	.021	60.00	.540.97	-.0512	.6290	2.155	
8.90	.3489	-.1034	.0140	.046	60.00					
17.93	.2400	-.1206	.0300	.098	60.00					
22.45	.1826	-.1297	.0370	.124	60.00					
27.02	.1865	-.1291	.0450	.150	60.00					
36.07	.2268	-.1258	.0600	.202	60.00					
45.79	.2248	-.1240	.0750	.254	60.00					
62.32	.2557	-.1181	.1040	.353	60.00					
90.37	.2994	-.1117	.1510	.514	60.00					
135.16	.3545	-.1024	.2260	.772	60.00					
180.70	.4053	-.0943	.3020	1.033	60.00					
225.63	.4529	-.0868	.3780	1.291	60.00					
271.02	.4930	-.0804	.4540	1.552	60.00					

**GROUP 1C**

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	MJ	THEJ	D*	DJ	DJ/DB
1.00	1.00	.50	.50	*.20	0.00	1.00	0.20	.50	.20	0.00
MF	TDF	PF	GJ	LFNGTH	RN/IN	MF	TDF	PF	GJ	LENGTH
2.50	107.70	1.73	1.40	.47	15.0	3.00	107.70	1.11	1.40	15.0
PC/PF	PB/PF	CPR	RMF	CT	TC	PC/PF	PB/PF	CPR	RMF	CT
*.49	*.4883	-.1200	.0009*	~.006*	73.00	1.79	*.4983	-.0949	.0040	.68.00
1.14	*.5532	-.1255	.0030	.004	73.00	9.04	*.2467	-.1206	.0210	.68.00
1.72	*.5181	-.1130	.0050	.010	73.00	17.81	*.2397	*.1256	.0410	.1377
2.59	*.4739	-.1240	.0080	.020	73.00	35.51	*.2745	-.1162	.0830	.279
5.47	*.4119	-.1379	.0180	.054	73.00	72.53	*.3784	-.0996	.1700	.577
11.22	*.2368	-.1789	.0370	.121	73.00	108.70	*.4592	-.0868	.2550	.468
22.75	*.2517	-.1711	.0760	.254	73.00	165.36	*.5705	-.0686	.3880	1.324
46.42	*.3428	-.1502	.1560	.528	73.00					
69.28	*.4149	-.1337	.2340	.793	73.00					
94.75	*.4886	-.1169	.3000	1.089	73.00					

GROUP 2A

MJ	THFJ	D*	DJ	DJ/D8	XJ/D8	MJ	THFJ	D*	DJ	DJ/D8	XJ/D8
1.78	0.10	0*	0.42	0.16	0.00	1.78	0.30	*35	*42	*16	0.00
MF	TOF	PF	GJ	LFNGTH	RN/N	MF	TOF	PF	GJ	LENGTH	RN/N
2.50	93.0	1.69	1.40	15.0	.47	2.50	93.30	.85	1.40	15.0	.23
PC/PF	CPF	RMF	TC	PC/PF	CPA	RMF	CT	TC	CT	xJ/D8	0.00
3.49	4.97	-1.159	-0.043*	-0.004*	-0.004*	60.00	60.00	-1.159	-0.006*	-0.004*	60.00
1.18	*5.517	-*1.026	-*0.016*	-*0.002*	-*0.002*	60.00	60.00	*1.154	*3020	*733	60.00
2.14	*50.34	-*1.134	-*0.070	-*0.012	-*0.012	60.00	60.00	-1.152	*3332	1-104	60.00
5.42	*4257	-*1.312	-*0.150	-*0.030	-*0.030	60.00	60.00	-1.152	*4530	*4530	60.00
11.81	-3518	-*1.481	-*0.300	-*0.067	-*0.067	60.00	60.00	-1.1440	*6040	*1.75	60.00
12.69	-1736	-*1.724	-*1.888	-*0.450	-*0.104	60.00	60.00	-1.1368	*7540	*8450	60.00
23.59	*1724	-*1.891	-*0.600	-*1.142	-*1.142	60.00	60.00	-1.1301	*9050	*2.213	60.00
29.52	*1853	-*1.862	-*0.750	-*1.179	-*1.179	60.00	60.00	-1.1301	*3522	*83	60.00
40.68	*2137	-*1.798	-*1.040	-*2.49	-*2.49	60.00	60.00	-1.1301	*4303	*4303	60.00
58.97	*2397	-*1.737	-*1.150	-*1.364	-*1.364	60.00	60.00	-1.1301	*2050	*2050	60.00
88.36	*2728	-*1.662	-*2.260	-*549	-*549	60.00	60.00	-1.1301	*1050	*1050	60.00
117.67	*2991	-*1.601	-*3.020	-*734	-*734	60.00	60.00	-1.1301	*1050	*1050	60.00
147.32	*3234	-*1.546	-*3.780	-*920	-*920	60.00	60.00	-1.1301	*1050	*1050	60.00
176.83	*3464	-*1.493	-*4.540	-*1.106	-*1.106	60.00	60.00	-1.1301	*1050	*1050	60.00
MJ	THFJ	D*	DJ	DJ/D8	XJ/D8	MJ	THFJ	D*	DJ	DJ/D8	XJ/D8
1.78	2.30	0*	0.42	0.16	0.00	1.78	0.30	*35	*42	*16	0.00
MF	TOF	PF	GJ	LFNGTH	RN/N	MF	TOF	PF	GJ	LENGTH	RN/N
3.00	93.90	1.10	1.40	15.0	.51	3.00	93.10	.55	1.40	15.0	.25
PC/PF	CPF	RMF	TC	PC/PF	CPB	RMF	CT	TC	CT	xJ/D8	0.00
3.8	-3543	-*1.024	-*0.003*	-*0.003*	-*0.003*	60.00	60.00	-1.1131	*3210	*784	60.00
.90	-4256	-*0.911	-*0.008*	-*0.002*	-*0.002*	60.00	60.00	-1.1080	*4800	*1.174	60.00
1.81	-4113	-*0.934	-*0.017*	-*0.004*	-*0.004*	60.00	60.00	-1.1027	*1027	*1.570	60.00
4.52	-3194	-*1.080	-*0.080	-*0.015	-*0.015	60.00	60.00	-1.1027	*6420	*6420	60.00
8.90	-2988	-*1.112	-*0.150	-*0.034	-*0.034	60.00	60.00	-1.1027	*8030	*966	60.00
117.95	-1.456	-*1.256	-*0.930	-*0.073	-*0.073	60.00	60.00	-1.1012	*9640	*2.359	60.00
26.99	-1.593	-*1.334	-*0.880	-*1.113	-*1.113	60.00	60.00	-1.1012	*9640	*9640	60.00
36.03	-1.704	-*1.316	-*0.840	-*1.152	-*1.152	60.00	60.00	-1.1012	*9640	*9640	60.00
45.10	-1.793	-*1.302	-*0.800	-*1.192	-*1.192	60.00	60.00	-1.1012	*9640	*9640	60.00
62.39	-1.951	-*1.277	-*1.110	-*2.68	-*2.68	60.00	60.00	-1.1012	*9640	*9640	60.00
95.30	-2329	-*1.217	-*1.110	-*3.39	-*3.39	60.00	60.00	-1.1012	*9640	*9640	60.00
135.15	-2651	-*1.166	-*2.000	-*586	-*586	60.00	60.00	-1.1012	*9640	*9640	60.00
180.34	-2942	-*1.120	-*3.210	-*783	-*783	60.00	60.00	-1.1012	*9640	*9640	60.00
225.59	-3146	-*1.076	-*4.020	-*981	-*981	60.00	60.00	-1.1012	*9640	*9640	60.00
271.23	-3489	-*1.033	-*4.830	-*1.880	-*1.880	60.00	60.00	-1.1012	*9640	*9640	60.00

**GROUP 2B**

MJ	THEJ	D*	DJ	DJ/DR	XJ/DR	MJ	THFJ	D*	DJ	DJ/DR
1.78	0.00	.42	.50	.20	C.30	1.78	1.70	.42	.50	.20
MF	T0F	?F	GJ	LENGTH	RN/IN	MF	T0F	PF	GJ	LFNGTH
2.50	93.70	1.69	1.40	.47		2.50	93.70	.85	1.40	15.0
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	CPB/PF	RMF	CT	TC
.49	.4787	-.1191	.0009*	~.006*	60.00	.4773	~.1194	*.0010*	~.0006*	60.00
1.17	.5379	-.1056	.0023*	~.003*	60.00	.3450	~.1487	*.4280	1.0440	60.00
2.95	.4662	-.1220	.0100	.017	60.00	.3983	~.1375	*.6420	1.564	60.00
6.68	.3658	-.1449	.0200	.041	60.00	.235.72	*.1282	*.8570	2.092	60.00
11.64	.2238	-.1773	.0420	.094	60.00	.29.34	*.1203	*.0670	2.606	60.00
17.55	.1828	-.1867	.0630	.147	60.00	.4733	*.1164	1.1740	2.869	60.00
23.59	.2033	-.1820	.0850	.199	60.00	.322.80	*.4925			
29.38	.2253	-.1770	.1060	.252	60.00					
58.75	.2865	-.1630	.2130	.514	60.00					
88.27	.3298	-.1531	.3210	.778	60.00					
117.81	.3643	-.1452	.4780	1.041	60.00					
146.72	.3914	-.1391	.5340	1.301	60.00					
150.28	.3947	-.1383	.5460	1.329	60.00					
MJ	THEJ	D*	DJ	DJ/DR	XJ/DR	MJ	THFJ	D*	DJ	DJ/DR
1.78	0.30	.42	.50	.20	C.30	1.78	1.70	.42	.50	.20
MF	T0F	PF	GJ	LFNGTH	RN/IN	MF	T0F	PF	GJ	LFNGTH
3.70	93.70	1.10	1.40	.51		3.00	93.70	.55	1.40	15.0
PC/PF	DR/PF	CPB	RMF	CT	TC	PC/PF	CPB/PF	RMF	CT	TC
.38	.3558	-.1022	.0005*	~.005*	60.00	.3251	~.1071	*.4550	1.109	60.00
.49	.4385	-.0R91	.0012*	~.003*	60.00	.3623	~.1012	*.6810	1.662	60.00
4.52	.2857	-.1134	.0110	.021	60.00	.3891	~.0953	*.9100	2.224	60.00
9.21	.2288	-.1224	.0220	.040	60.00	.450.61	*.4347	*.0R97	1.13R0	2.784
18.73	.1645	-.1326	.0450	.105	60.00	.541.97	*.4743	*.0834	1.3660	3.343
27.75	.1818	-.1298	.0680	.161	60.00					
45.22	.2068	-.1258	.1140	.273	60.00					
62.45	.2439	-.1200	.1570	.380	60.00					
90.45	.2754	~.1150	.2280	.553	60.00					
134.95	.3125	~.1091	.3410	.829	60.00					
180.50	.3433	~.1042	.4560	1.111	60.00					
225.64	.3719	~.0996	.5700	1.391	60.00					
263.15	.3969	~.0957	.6640	1.623	60.00					



**GROUP 2E**

MJ	THFJ	D*	DJ	DJ/DB	XJ/DB	RN/IN	MJ	THEJ	D*	DJ	DJ/DB	XJ/DB
MJ	20.00	.42	.50	.20	0.00	.47	1.78	20.20	.42	.50	.20	0.00
MF	TOF	PF	GJ	LENGTH	RN/IN	MJ	TOF	PF	GJ	LENGTH	RN/IN	MJ
2.50	100.00	1.73	1.40	15.0	.47	3.00	100.00	1.11	1.40	15.0	.51	1.78
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF
.49	.4875	-.1195	.0009*	-.006*	63.00	.38	.3679	-.1012	.0005*	65.00	.000*	.0005*
1.15	.5325	-.1064	.0023*	-.004*	63.00	1.79	.4165	-.0934	.0024*	.045	.045	.0210
5.35	.3333	-.1956	.0190	.038	63.00	8.33	.2964	-.1125	.104	.65.00	.65.00	.1946
11.34	.2919	-.1653	.0410	.092	63.00	17.94	.1288	-.1270	.215	.65.00	.65.00	.0450
22.65	.1947	-.1894	.0820	.192	63.00	35.81	.2066	-.2090	.2740	.666	.666	.3176
46.34	.2568	-.1740	.1610	.404	63.00	108.57	.1091	.1091	.4560	.1.113	.1.113	.180.75
69.44	.3719	-.1630	.2520	.410	63.00	180.75	.4132	.0938	.4560	.5350	.5350	.212.05
139.99	.4202	-.1350	.5090	1.239	63.00	212.05	.4528	-.0875	.4528	.0.00	.0.00	.1.306

**GROUP 2F**

MJ	THFJ	D*	DJ	DJ/DB	XJ/DB	RN/IN	MJ	THEJ	D*	DJ	DJ/DB	XJ/DB
MJ	20.00	.63	.75	.30	0.00	.47	1.78	20.20	.63	.75	.30	0.00
MF	TOF	PF	GJ	LENGTH	RN/IN	MJ	TOF	PF	GJ	LENGTH	RN/IN	MJ
2.50	100.00	1.73	1.40	15.0	.47	3.00	100.00	1.11	1.40	15.0	.51	1.78
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF
.50	.4888	-.1192	.0022*	-.015*	70.00	.39	.3689	-.0113	.0012*	.67.00	.67.00	.0055*
1.15	.5516	-.1046	.0051*	-.009*	70.00	1.78	.2992	-.0964	.0024*	.67.00	.67.00	.8.53
2.44	.4513	-.1281	.0110*	-.003*	70.00	17.71	.1327	.1327	.1000	.232	.232	.2239
5.50	.3038	-.1626	.0450	.089	70.00	35.87	.2941	-.1246	.2030	.485	.485	.1133
11.35	.2264	-.1853	.0920	.207	70.00	72.79	.3971	-.1091	.4130	.999	.999	.0966
23.26	.2767	-.1690	.446	.900	70.00	111.40	.5135	-.0793	.6330	1.537	1.537	.6330
46.40	.3751	-.1458	.3790	.910	70.00							
69.20	.4507	-.1282	.5660	1.367	70.00							

## GROUP 3A

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	MJ	THEJ	D*	DJ	DJ/DB	XJ/DB
2.20	0.20	.35	.50	.20	0.00	2.27	1.0	.35	.50	.20	0.00
MF	TDF	PF	GJ	LFGTH	RN/IN	MF	TDF	PF	GJ	LENGTH	QN/IN
2.50	93.20	1.69	1.40	15.0	.47	2.90	93.0	.85	1.40	15.0	.23
PC/PF	PB/PF	CPB	RME	CT	PC/PF	PB/PF	CPB	RME	CT	TC	00.00
.49	.4797	-.1189	-.006*	-.006*	.49	.4766	-.1196	.0009*	-.006*	.774	00.00
1.18	.5433	-.1043	-.0023*	-.003*	60.00	.7596	-.1692	.2410	.2410	1.164	60.00
2.95	.4934	-.1164	-.0054*	-.003*	60.00	.1764	-.2871	.5110	.5110	1.160	60.00
5.03	.4102	-.1347	-.0170	-.030	60.00	.236.08	-.3108	.1575	.6830	1.160	60.00
11.81	.2546	-.1703	-.0340	-.069	60.00	.293.96	-.3277	.1536	.9510	1.145	60.00
17.73	.1553	-.1930	-.0510	-.108	50.00	.346.13	-.3457	.1496	1.0080	2.305	60.00
23.62	.1656	-.1907	-.0680	-.147	60.00	23.62	1.0	.35	.50	.20	0.00
29.62	.1763	-.1882	-.0850	-.187	60.00	29.62	1.0	.35	.50	.20	0.00
59.27	.2264	-.1768	-.1710	-.383	60.00	59.27	1.0	.35	.50	.20	0.00
88.4	.2594	-.1713	-.2560	-.579	60.00	88.4	1.0	.35	.50	.20	0.00
118.08	.2697	-.1659	-.3420	-.776	60.00	118.08	1.0	.35	.50	.20	0.00
147.12	.2845	-.1635	-.4260	-.969	60.00	147.12	1.0	.35	.50	.20	0.00
176.94	.2984	-.1603	-.5120	1.167	60.00	176.94	1.0	.35	.50	.20	0.00
MJ	THFJ	D*	DJ	DJ/DB	XJ/DB	MJ	THFJ	D*	DJ	DJ/DB	XJ/DB
2.20	0.00	.35	.50	.20	0.00	2.20	1.0	.35	.50	.20	0.00
MF	TDF	PF	GJ	LFGTH	RN/IN	MF	TDF	PF	GJ	LENGTH	QN/IN
3.00	93.20	1.10	1.40	15.0	.51	3.00	93.00	.55	1.40	15.0	.25
PC/PF	PR/PF	CPR	RME	CT	PC/PF	PR/PF	CPB	RME	CT	TC	00.00
.38	.3561	-.1025	-.005*	-.005*	60.00	.167.43	-.1709	.3620	.3620	.826	60.00
.99	.4337	-.0898	-.0012*	-.003*	60.00	.20.58	-.2581	.3440	.3440	1.443	60.00
1.81	.4108	-.0935	-.0025*	-.003*	60.00	.361.14	-.2793	.1143	.1143	1.661	60.00
4.53	.3346	-.1103	-.0090	-.014	60.00	.451.39	-.3053	.1110	.9080	2.077	60.00
8.86	.2228	-.1235	-.0170	-.034	60.00	541.84	-.3253	.1070	1.0900	2.495	60.00
17.93	.1389	-.1366	-.0360	-.076	60.00	17.93	1.0	.35	.50	.20	0.00
27.01	.1503	-.1348	-.0540	-.118	60.00	27.01	1.0	.35	.50	.20	0.00
36.08	.1571	-.1337	-.0720	-.160	60.00	36.08	1.0	.35	.50	.20	0.00
45.11	.1633	-.1327	-.0900	-.201	60.00	45.11	1.0	.35	.50	.20	0.00
62.38	.1794	-.1302	-.1250	-.281	60.00	62.38	1.0	.35	.50	.20	0.00
90.44	.2014	-.1267	-.1810	-.411	60.00	90.44	1.0	.35	.50	.20	0.00
135.20	.2217	-.1236	-.2710	-.617	60.00	135.20	1.0	.35	.50	.20	0.00
179.92	.2398	-.1206	-.3610	-.824	60.00	179.92	1.0	.35	.50	.20	0.00
225.44	.2577	-.1179	-.4530	1.034	60.00	225.44	1.0	.35	.50	.20	0.00
273.63	.2757	-.1149	-.5500	1.257	60.00	273.63	1.0	.35	.50	.20	0.00

**GROUP 3B**

MJ	THE J	D*	DJ	NJ/DB	XJ/DB	MJ	THE J	D*	DJ	NJ/DB	XJ/DB
2.20	20.70	.16	.50	.20	0.00	2.20	21.20	.16	.50	.20	0.00
MF	TDF	PF	GJ	LENGTH	RN/IN	MF	TDF	PF	GJ	LENGTH	RN/IN
2.50	108.70	1.69	1.40	15.0	.47	3.00	98.00	.10	1.40	15.0	.51
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPB	RMF	CT	TC
11.83	.2667	-.1676	.0340	.069	70.00	1.81	.4109	-.0534	.0025*	0.000*	70.00
17.81	.1589	-.1922	.0510	.109	70.00	4.54	.3198	-.1019	.014	70.00	
23.79	.1559	-.1929	.0680	.149	70.00	18.09	.1346	-.1079	.077	70.00	
44.59	.1925	-.1845	.1290	.287	70.00	27.29	.1520	-.1335	.0360	70.00	
59.35	.2146	-.1795	.1710	.385	70.00	36.39	.1669	-.1323	.0540	70.00	
88.76	.2512	-.1711	.2570	.581	70.00	68.29	.2049	-.1263	.0730	70.00	
118.60	.2877	-.1627	.3430	.779	70.00	91.09	.2231	-.1233	.1308	70.00	
148.34	.3157	-.1565	.4290	.977	70.00	136.40	.2562	-.1180	.1630	70.00	
						181.40	.2740	-.1160	.1414	70.00	
						309.4	.3640	-.1110	.1623	70.00	
						227.19	.3963	-.1053	.1631	70.00	
						227.19	.4570	-.1053	.1042	70.00	

**GROUP 4A**

MJ	THE J	D*	DJ	NJ/DB	XJ/DB	MJ	THE J	D*	DJ	NJ/DB	XJ/DB
2.70	0.70	.28	.50	.20	0.00	2.70	1.70	.28	.50	.20	0.00
MF	TDF	PF	GJ	LENGTH	RN/IN	MF	TDF	PF	GJ	LENGTH	RN/IN
2.50	93.10	1.69	1.40	15.0	.47	2.50	93.10	.85	1.40	15.0	.23
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPB	RMF	CT	TC
.49	.4864	-.1173	.0009*	-.006*	60.00	.4743	-.1201	-.006*	-.006*	60.00	
.59	.5080	-.1124	.0111*	-.006*	60.00	117.32	.1820	-.2350	-.501	60.00	
1.18	.5559	-.1014	.0023*	-.003*	60.00	176.22	.2034	-.2178	-.3530	76.5	
1.77	.5472	-.1034	.0035*	-.001*	60.00	235.27	.2178	-.1787	-.4710	1.025	
2.94	.5301	-.1073	.0058*	-.0117*	60.00	293.67	.2234	-.1758	-.5180	1.2H3	
5.65	.4581	-.1238	.0117*	-.016*	60.00	352.49	.2401	-.1737	-.7060	1.441	
11.77	.3933	-.1386	.0230	-.042	60.00		.2477	-.1720	-.1720	60.00	
14.73	.3483	-.1489	.0290	-.055	60.00					60.00	
17.68	.1517	-.1941	.0350	-.068	60.00					60.00	
20.66	.1435	-.1957	.0410	-.081	60.00					60.00	
23.58	.1462	-.1951	.0470	-.094	60.00					60.00	
29.46	.1533	-.1935	.0590	-.120	60.00					60.00	
40.70	.1711	-.1894	.0810	-.169	60.00					60.00	
58.95	.1843	-.1864	.1180	-.250	60.00					60.00	
88.32	.1974	-.1834	.1760	-.379	60.00					60.00	
117.16	.2080	-.1810	.2360	-.509	60.00					60.00	
147.39	.2158	-.1792	.2950	-.639	60.00					60.00	
176.48	.2222	-.1777	.3590	.767	60.00					60.00	

**GROUP 4A (Concluded)**

MJ	THFJ	D*	DJ	DJ/DR	XJ/DR	MJ	TMFJ	D*	DJ	NJ/DR
2.70	0.70	.28	.50	.20	0.00	2.70	2.70	.28	.50	.20
MF	TUF	PF	GJ	LENGTH	RN/IN	4F	TOF	PF	GJ	LEN/IN
3.00	93.70	1.10	1.40	15.0	.51	3.00	93.70	.55	1.40	15.0
PC/PF	OB/PF	CPR	RMF	CT	TC	PC/PF	PB/PF	CPR	RMF	CT
*38	*3544	*1024	*0005*	*005*	60.00	183.74	*1873	*1289	*545	60.00
*90	*4293	*0005	*0012*	*005*	60.00	270.05	*1961	*1275	*3750	*818
4.53	3.657	-1.638	*0062	*004*	60.00	360.09	*2267	*1259	*5010	*094
8.94	2375	-1.221	*0120	*02C	60.00	450.25	*2157	*1244	*6260	*369
17.99	1226	-1.392	*0250	*048	60.00	543.90	*2249	*1230	*7520	*6446
27.13	1275	-1.134	*0370	*076	60.00					
45.54	1353	-1.1372	*0630	*132	60.00					
62.40	62	-1.572	*0860	*184	60.00					
90.49	90	-1.1348	*1250	*270	60.00					
135.09	135	-1.559	*1339	*406	60.00					
180.44	180	-1.661	-1.323	*2510	60.00					
225.76	225	-1.758	-1.1308	*3140	60.00					
270.93	270	-1.846	-1.294	*3140	60.00					
		-1.934	-1.280	*3770	60.00					
		-1.934	-1.280	*821	60.00					

**GROUP 4B**

MJ	THFJ	D*	DJ	DJ/DR	XJ/DR	MJ	THEJ	D*	DJ	NJ/DR
2.70	1.70	.3c	.62	.25	0.00	2.70	0.00	.35	.62	.25
MF	TUF	PF	GJ	LENGTH	RN/IN	4F	TOF	PF	GJ	LEN/IN
2.50	93.70	1.69	1.40	15.0	.23	2.50	93.70	.85	1.40	15.0
PC/PF	OB/PF	CPR	RMF	CT	TC	PC/PF	PB/PF	CPR	RMF	CT
*49	*4782	*1192	*0015*	*011*	60.00	*50	*741	*1201	*0015*	*0.00
1.18	*5554	-1.016	*0031*	*006*	60.00	116.88	*2136	*1797	*3700	*798
2.94	4973	-1.148	*0193*	*006*	60.00	175.99	*2299	*1762	*5570	*210
5.89	4021	-1.366	*0186*	*026*	60.00	235.07	*2407	*1735	*7440	*621
11.79	1452	-1.193	*0370	*067	60.00	293.34	*2519	*1709	*9220	*2026
17.70	138	-1.956	*0560	*108	60.00	147.13	*2619			
23.60	1541	-1.1933	*0740	*149	60.00					
29.50	1669	-1.1906	*0930	*190	60.00					
58.94	1957	-1.1858	*1860	*395	60.00					
86.39	2106	-1.1804	*2800	*600	60.00					
118.08	2212	-1.1760	*3740	*807	60.00					
147.35	2261	-1.1759	*4660	*1010	60.00					
154.19	2329	-1.1753	*4880	*1058	60.00					

**GROUP 4B (Concluded)**

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	MJ	THEJ	D*	DJ	DJ/DB	XJ/DB
MF	TDF	PF	GJ	LENGTH	RN/IN	MF	TDF	PF	GJ	LENGTH	RN/IN
2.70	1.70	.35	.62	.25	0.00	2.70	2.20	.35	.62	.25	0.00
3.00	9.70	1.10	1.40	15.0	.25	3.00	93.70	.55	1.40	15.0	.51
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPB	RMF	CT	TC
*38	*348	*1024	*0008*	*0008*	60.00	183.14	*1966	*1275	*3960	*860	40.00
*90	*432	-0.83	*0019*	*0019*	60.00	*2105	*1253	*5950	1.296	40.00	
*452	*274	*1115	*009*	*009*	60.00	360.09	*2223	*1234	*7920	1.730	40.00
8.94	*196	*1397	*0190	*033	60.00	449.74	*2327	*1217	*9890	2.163	40.00
17.99	*1277	*1385	*0390	*076	60.00	541.83	*2443	*1199	1.1920	2.608	40.00
27.03	*1227	*1376	*0590	*120	60.00						
36.09	*1311	*1369	*0990	*164	60.00						
45.24	*1335	*1359	*0990	*208	60.00						
62.33	*1581	*1316	*1370	*291	60.00						
90.41	*1536	*1327	*1980	*426	60.00						
135.21	*1739	*1311	*2970	*643	60.00						
180.42	*1660	*1295	*3970	*861	60.00						
225.96	*1937	*1279	*4970	*1081	60.00						
271.10	*2078	*1257	*5960	*1300	60.00						

**GROUP 4C**

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	MJ	THEJ	D*	DJ	DJ/DB	XJ/DB
MF	TDF	PF	GJ	LENGTH	RN/IN	MF	TDF	PF	GJ	LENGTH	RN/IN
2.70	13.70	.28	.50	.20	0.00	2.70	10.70	.28	.50	.20	0.00
2.50	100.00	1.73	1.40	15.0	.47	3.00	99.00	1.10	1.40	15.0	.51
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPB	RMF	CT	TC
*49	*4897	*1192	*0009*	*0006*	63.00	1.81	*14142	*3467	*9929	*0025*	70.00
1.16	*5468	*1058	*0023*	*0004*	63.00	4.54	*3467	*1036	*1036	*0063*	70.00
*49	*4706	*1236	*0110*	*0115*	63.00	17.95	*1158	*1403	*1403	*0240	70.00
11.29	*4009	*1399	*0220	*040	63.00	27.11	*1291	*1382	*1382	*0370	70.00
23.12	*1361	*2017	*0460	*092	63.00	36.17	*1383	*1367	*1367	*0500	70.00
6.88	*1727	*1929	*1400	*298	63.00	68.11	*1617	*1330	*1330	*0940	70.00
116.87	*2124	*1833	*2340	*505	63.00	90.86	*1673	*1321	*1321	*1260	70.00
162.33	*2388	*1777	*3250	*705	63.00	135.63	*1865	*1291	*1291	*1880	70.00
						161.08	*2066	*1259	*1259	*2520	70.00
						226.59	*2215	*1235	*1235	*3150	70.00

GROUP 4D

GROUP 4E

**GROUP 4E (Concluded)**

MJ	THEJ	D*	MJ	DJD8	XJD8	MJ	THEJ	D*	MJ	DJD8	XJD8	MJ	THEJ	D*	MJ	DJD8	XJD8
2.70	.29.70	.0*	2.70	.20	.00	2.70	.29.20	.0*	2.70	.20	.00	2.70	.29.20	.0*	2.70	.20	.00
MF	TOF	PF	GJ	LNGTH	RNVIN	MF	TOF	PF	GJ	LNGTH	RNVIN	MF	TOF	PF	GJ	LNGTH	RNVIN
3.50	0.70	.69	1.40	15.0	.50	4.00	95.00	.44	1.40	15.0	.50	2.26	CPI	RNF	CJ	TC	
PC/PF	PB/PF	CPI	RNF	CJ	TC	PC/PF	PB/PF	CPI	RNF	CJ	TC	-.0701	.0017*	0.000*	60.00		
.60	.2837	-.0836	-.0066*	-.003*	-	4.53	.2142	4.53	.0330	.004	60.00	-.0780	-.0133	.0030	60.00		
.60	.7795	-.0840	-.0066*	-.003*	-	6.80	.1512	6.80	-.0757	.0020	60.00	-.0780	-.0151	.0020	60.00		
.62	.2821	-.0837	-.0066*	-.003*	-	11.31	.1335	11.31	-.0773	.0080	60.00	-.0780	-.0134	.0080	60.00		
1.47	.3475	-.0760	-.0015*	-.001*	-	22.35	.1316	22.35	-.0775	.0170	60.00	-.0780	-.0170	.0170	60.00		
2.88	.3311	-.0780	-.0059*	-.001*	-	33.57	.1470	33.57	-.0761	.0260	60.00	-.0780	-.0154	.0260	60.00		
4.30	.2865	-.0812	-.0032	-.004*	-	66.86	.1643	66.86	-.0728	.0520	60.00	-.0780	-.0111	.0520	60.00		
5.78	.2317	-.0895	-.0050	-.008	-	89.63	.1991	89.63	-.0715	.0700	60.00	-.0780	-.0150	.0700	60.00		
7.12	.1811	-.0954	-.0070	-.011	-	163.69	.2391	163.69	-.0679	.1250	60.00	-.0780	-.272	.1250	60.00		
8.64	.1717	-.0965	-.0080	-.014	-												
10.00	.1717	-.0955	-.0080	-.014	-												
11.52	.1639	-.0975	-.0100	-.017	-												
14.22	.1467	-.1002	-.0102	-.021	-												
16.13	.1128	-.1022	-.0160	-.027	-												
17.21	.1169	-.1029	-.0170	-.031	-												
21.54	.1169	-.1029	-.0210	-.043	-												
28.81	.1253	-.1020	-.0210	-.060	-												
57.53	.1529	-.0987	-.0580	-.124	-	2.70	20.50	.24	DJ	DJD8	XJD8	2.70	20.50	.24	DJ	DJD8	XJD8
86.34	.1769	-.0959	-.0880	-.189	-	MF	TOF	PF	GJ	LENGTH	RNVIN	MF	TOF	PF	GJ	LENGTH	RNVIN
115.19	.1656	-.0949	-.1170	-.253	-	4.50	9.70	.28	1.40	15.0	.50	PC/PF	PB/PF	CPI	RNF	CJ	TC
230.31	.2266	-.0901	-.2310	-.512	-	1.23	.2093	1.23	-.0007*	.0007*	-	3.60	.2008	3.60	-.0022*	.0022*	-
316.85	.2515	-.0872	-.3210	-.706	-	7.12	.1694	7.12	-.0855	.0040	-	10.72	.1414	10.72	-.0606	.011	-
432.17	.2491	-.0829	-.4410	.965	-	14.25	.1353	14.25	-.0610	.0080	-	17.83	.1556	17.83	-.0595	.0116	-
						24.96	.1529	24.96	-.0597	.0150	-	32.14	.1653	32.14	-.0588	.0190	-
						39.18	.1681	39.18	-.0586	.0240	-	53.59	.1835	53.59	-.0576	.0330	-
						71.61	.1954	71.61	-.0567	.0440	-	142.85	.2478	142.85	-.0530	.094	-
						214.49	.2694	214.49	-.0515	.0880	-	286.75	.3731	286.75	-.0491	.191	-
						574.09	.3345	574.09	-.0469	.1320	-	786.54	.3779	786.54	-.0438	.288	-
						1074.88	.4192	1074.88	-.0409	.1760	-						

## GROUP 4F

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB		MJ	THEJ	D*	DJ	DJ/DB	
2.70	20.00	.42	.75	.30	0.00		2.70	23.70	.47	.75	.30	
MF	TDF	PF	GJ	LENGTW	RN/IN		MF	TDF	PF	GJ	LENGTW	RN/IN
2.50	122.70	1.73	1.40	15.0	.48		3.00	103.70	1.11	1.40	15.0	.34
PC/PF	PB/PF	CBA	RNF	CT	TC		PC/PF	PR/PF	CBA	RMF	CT	TC
*50	*4868	-1200	-0022*	-015*	67.00		*39	*3674	-1.15	*0012*	-01*	65.00
1.16	.5933	-1044	-0052*	-009*	67.00		1.80	*4175	-1.935	-001*	-01*	65.00
2.55	.5058	-1155	-0114*	-004*	67.00		7.14	*1.643	-1.340	*0220	-034	65.00
5.31	.4046	-1392	-0229*	-032*	67.00		16.14	*1.468	-1.369	*0500	-096	65.00
11.30	.1291	-2036	-0500	-091	67.00		34.36	*1.848	-1.307	*1010	-221	65.00
22.78	.1613	-1958	-1020	-205	67.00		71.33	*2224	-2.243	*2230	-476	65.00
70.09	.2374	-1779	-3160	-673	67.00		34.66	*1.869	-1.303	*1000	-224	65.00
115.35	.3059	-1620	-5200	1.121	67.00		16.05	*214	-1.407	*0500	-096	65.00
138.69	.3310	-1559	-6260	1.354	67.00		14.87	*2956	-1.126	*4530	-981	65.00
							18.74	*3266	-1.079	*5630	-1.228	65.00
							21.56	*5155	-1.107	*0017*	-0.10*	65.00
							218.30	*3550	-1.034	*6830	1.486	65.00

## GROUP 5A

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB		MJ	THEJ	D*	DJ	DJ/DB	
3.20	0.70	.22	.50	.20	0.00		3.20	0.70	.22	.50	.20	
MF	TDF	PF	GJ	LENGTW	RN/IN		MF	TDF	PF	GJ	LENGTW	RN/IN
2.50	93.70	1.69	1.40	15.0	.47		2.50	93.70	.85	1.40	15.0	.23
PC/PF	PB/PF	CBA	RNF	CT	TC		PC/PF	PR/PF	CBA	RMF	CT	TC
*48	*4790	-1190	-0009*	-007*	60.00		*4761	*1197	*0009*	-006*	-0.00	60.00
1.18	.5311	-1071	-0023*	-003*	60.00		117.84	*1722	*1892	*325	*325	60.00
2.95	.5213	-1071	-0059*	-003*	60.00		176.17	*1791	*1876	*2330	*490	60.00
5.91	.4852	-1176	-0118*	-016*	60.00		225.03	*1869	*1860	*3110	*657	60.00
11.85	.4127	-1343	-0237*	-043*	60.00		293.47	*1916	*1847	*3890	*823	60.00
17.74	.3851	-1405	-0355*	-068*	60.00		352.74	*1973	*1834	*4670	*991	60.00
23.62	.3502	-1485	-0310	-057	60.00							
29.55	.2955	-1562	-0390	-074	60.00							
58.97	.1577	-1926	-0780	-158	60.00							
88.44	.1637	-1912	-1170	-241	60.00							
117.90	.1701	-1896	-1560	-325	60.00							
147.34	.1772	-1880	-1950	-408	60.00							
176.70	.1831	-1867	-2340	-492	60.00							

**GROUP 5A (Concluded)**

MJ	TMEJ	D*	DJ	DJ/DB	XJ/DB	MJ	TMEJ	D*	DJ	DJ/DB	XJ/DB
3.20	.3.10	.22	.50	.20	0.00	3.20	0.30	.22	.50	.20	0.00
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	RN/IN
3.00	93.00	1.10	1.40	15.0	.51	3.00	93.00	.55	1.40	15.0	.25
PC/PF	PB/PF	CPR	RMF	CT	TC	PC/PF	PB/PF	CPR	RMF	CT	TC
.38	.3552	-.1023	.0005*	-.005*	60.00	176.00	-.1563	-.139	.1640	.345	60.00
.90	.4145	-.0929	.0012*	-.003*	60.00	270.45	.1623	-.1329	.2480	.526	60.00
4.52	.3811	-.0982	.0062*	-.007*	60.00	360.33	.1699	-.1318	.3310	.703	60.00
9.01	.3005	-.1110	.0125*	-.021*	60.00	451.45	.1762	-.1307	.4150	.862	60.00
18.02	.1247	-.1389	.0160	.029	60.00	542.05	.1813	-.1299	.4990	1.061	60.00
27.11	.1138	-.1411	.0240	.047	60.00	60.00	60.00	60.00	60.00	60.00	60.00
47.30	.1202	-.1396	-.0410	.082	60.00	60.00	60.00	60.00	60.00	60.00	60.00
62.45	.1250	-.1388	-.0770	.116	60.00	60.00	60.00	60.00	60.00	60.00	60.00
93.59	.1286	-.1383	.0830	.172	60.00	60.00	60.00	60.00	60.00	60.00	60.00
135.30	.1339	-.1374	.1240	.260	60.00	60.00	60.00	60.00	60.00	60.00	60.00
180.58	.1405	-.1364	.1660	.349	60.00	60.00	60.00	60.00	60.00	60.00	60.00
225.68	.1471	-.1353	.2070	.438	60.00	60.00	60.00	60.00	60.00	60.00	60.00
271.73	.1535	-.1343	.2490	.527	60.00	60.00	60.00	60.00	60.00	60.00	60.00

MJ	TMEJ	D*	DJ	DJ/DB	XJ/DB	MJ	TMEJ	D*	DJ	DJ/DB	XJ/DB
3.20	.3.00	.35	.79	.31	0.00	3.20	0.30	.35	.79	.31	0.00
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	RN/IN
2.50	93.70	.85	1.40	15.0	.23	2.50	93.70	1.69	1.40	15.0	.47
PC/PF	PB/PF	CPR	RMF	CT	TC	PL/PF	PB/PF	CPR	RMF	CT	TC
.50	.4749	-.1200	.0025*	-.017*	60.00	.49	4.740	-.1193	.0060*	-.017*	60.00
117.49	.1846	-.1863	.827	.60.00	1.18	51.44	-.1080	.0150*	-.010*	60.00	60.00
175.73	.1936	-.1849	.5940	1.248	60.00	2.95	5.234	-.1080	.0150*	-.010*	60.00
234.21	.1977	-.1833	.7920	1.671	60.00	5.89	4.510	-.1080	.0150*	-.010*	60.00
292.94	.2062	-.1814	.9910	2.696	60.00	11.80	3.324	-.1225	.063*	-.109*	60.00
318.66	.2098	-.1806	1.0780	2.283	60.00	17.75	1.447	-.1554	.0000	.105	60.00
						23.60	1.491	-.1944	.0780	.147	60.00
						29.47	1.590	-.1944	.0990	.190	60.00
							58.72	1.796	-.1944	.401	60.00
							88.37	1.861	-.1944	.616	60.00
							117.67	1.897	-.1944	.829	60.00
							147.15	1.929	-.1944	1.041	60.00
							176.49	1.979	-.1944	1.254	60.00

**GROUP 5B**

MJ	TMEJ	D*	DJ	DJ/DB	XJ/DB	MJ	TMEJ	D*	DJ	DJ/DB	XJ/DB
3.20	.3.00	.35	.79	.31	0.00	3.20	0.30	.35	.79	.31	0.00
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	RN/IN
2.50	93.70	.85	1.40	15.0	.23	2.50	93.70	1.69	1.40	15.0	.47
PC/PF	PB/PF	CPR	RMF	CT	TC	PL/PF	PB/PF	CPR	RMF	CT	TC
.50	.4749	-.1200	.0025*	-.017*	60.00	.49	4.740	-.1193	.0060*	-.017*	60.00
117.49	.1846	-.1863	.827	.60.00	1.18	51.44	-.1080	.0150*	-.010*	60.00	60.00
175.73	.1936	-.1849	.5940	1.248	60.00	2.95	5.234	-.1080	.0150*	-.010*	60.00
234.21	.1977	-.1833	.7920	1.671	60.00	5.89	4.510	-.1080	.0150*	-.010*	60.00
292.94	.2062	-.1814	.9910	2.696	60.00	11.80	3.324	-.1225	.063*	-.109*	60.00
318.66	.2098	-.1806	1.0780	2.283	60.00	17.75	1.447	-.1554	.0000	.105	60.00
						23.60	1.491	-.1944	.0780	.147	60.00
						29.47	1.590	-.1944	.0990	.190	60.00
							58.72	1.796	-.1944	.401	60.00
							88.37	1.861	-.1944	.616	60.00
							117.67	1.897	-.1944	.829	60.00
							147.15	1.929	-.1944	1.041	60.00
							176.49	1.979	-.1944	1.254	60.00

**GROUP SB (Concluded)**

MJ	THFJ	D*	RJ	RJ/IN	MJ	TMFJ	RJ	RJ/IN
3.70	0.70	.36	.79	.31	3.20	3.20	.35	.31
MF	THF	PF	GJ	LFNGTM	MJ	TMF	RJ	RJ/IN
3.70	.73.70	1.10	1.40	1.5.0	.51	3.03	.55	.25
PC/PF	PB/PF	CPA	RMF	CT	PC/PF	PA/PF	CPA	TC
.79	.1025	.0113*	.0113*	.60.50	1.92.78	.1776	.4274*	.60.00
.91	.4412	.0086	.0031*	.61.50	270.10	.18K2	.61.46*	.60.00
4.53	.3333	.1058	.0160*	.60.50	60.01	.1674	.61.76	.60.00
9.03	.1517	.1346	.0210	.60.50	451.57	.2049	.62.61	.60.00
18.34	.1242	.1390	.0210	.60.50	541.52	.2123	.62.50	.60.00
27.39	.1253	.1368	.0630	.119	60.00			
45.21	.1191	.1382	.1060	.211	60.00			
62.49	.1387	.1367	.1060	.297	60.00			
90.58	.1477	.1364	.2120	.439	60.00			
115.27	.1459	.1355	.3170	.663	60.00			
140.40	.1537	.1344	.4230	.890	60.00			
226.35	.1603	.1333	.5310	.1.120	60.00			
270.94	.1669	.1322	.63160	.1.345	60.00			

**GROUP SC**

MJ	THFJ	D*	RJ	RJ/IN	MJ	TMFJ	D*	DJ	DJ/DB
3.70	21.70	.27	.50	.20	3.20	23.20	.22	.50	.20
MF	THF	PF	GJ	LFNGTM	MJ	TMF	RJ	RJ	RJ/IN
2.50	11R.10	1.69	1.40	1.47	3.00	97.00	1.10	1.40	.51
PC/PF	PB/PF	CPA	RMF	CT	PC/PF	PB/PF	CPA	RMF	TC
11.91	.4194	.0226	.023*	.60.50	1.81	.4138	.0935	.0025*	.70.00
17.85	.3267	.1629	.0357*	.70.00	4.65	.3865	.0973	.0063*	.70.00
23.83	.2884	.1626	.0310	.058	17.9	.1048	.1395	.0160	.70.00
44.57	.1277	.1993	.0590	.117	27.27	.1048	.1420	.0250	.70.00
59.43	.1366	.1973	.0780	.159	36.44	.1132	.1407	.0330	.70.00
89.10	.1443	.1955	.1180	.243	68.39	.1372	.1372	.0620	.70.00
118.64	.1621	.1915	.1570	.327	91.13	.1457	.1356	.0930	.70.00
148.26	.1764	.1881	.1960	.411	136.42	.1488	.1350	.262	.70.00
					181.71	.1645	.1326	.251	.70.00
					227.02	.1797	.1303	.440	.70.00

## GROUP 6A

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	NJ	THFJ	NJ	DJ/DB
3.80	20.30	.35	.50	.20	0.00	3.80	20.30	.35	.20
MF	TDF	PF	GJ	LFNGTH	AN/IN	MF	THF	PF	AN/IN
2.50	1)R.30	1.69	1.40	15.0	.47	3.00	95.30	1.10	1.40
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPB	RMF
11.85	.4711	-.1208	.0237*	.043*	70.00	.91	.4057	.0012*	.003*
17.82	.4249	-.1314	.0357*	.069*	70.00	1.61	.4765	.0015*	.000*
23.79	.3955	-.1382	.0476*	.095*	70.00	6.56	.4015	.0063*	.007*
44.53	.1783	-.2038	.0350	.065	70.00	9.42	.3646	.0108	.021*
59.38	.1163	-.2019	.0470	.090	70.00	18.21	.2721	.0115	.049*
89.22	.1237	-.2002	.0700	.139	70.00	27.31	.1398	.0150	.025
118.61	.1273	-.1994	.0940	.169	70.00	31.86	.1975	.0170	.030
148.28	.1385	-.1968	.1160	.239	70.00	36.79	.1966	.0200	.035
						45.20	.1028	.0290	.046
						45.57	.1715	.0250	.046
						68.40	.1124	.0370	.073
						91.21	.1214	.0400	.099
						136.63	.1374	.0750	.152
						159.36	.1280	.0800	.176
						181.61	.1294	.1000	.204
						227.48	.1397	.1250	.258
						272.80	.1465	.1351	.310

**GROUP 7A**

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	RN/IN	PJ	THEJ	D*	DJ	DJ/DB	XJ/DB	RN/IN	PJ	
2.70	20.00	.14	.25	.10	-0.60	2.70	20.00	.14	.25	.10	-0.60	2.70	20.00	.14	
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	PF	TOF	RN/IN	MF	TOF	PF	
2.50	95.0	1.96	1.40	15.0	.55	2.50	95.0	1.96	1.40	15.0	.55	2.50	95.0	1.96	
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPB	PC/PF	PB/PF	CPB	PC/PF	PB/PF	CPB	
.62	*5059	-.1117	*0003	-.002	75.00	.59	*5037	-.1122	.59	*5037	-.1122	.59	*5037	-.1122	.59
2.02	*5167	-.1097	*0010	*000	75.00	2.00	*5207	-.1084	2.00	*5207	-.1084	2.00	*5207	-.1084	2.00
20.68	*4187	-.1314	*0103	*021	75.00	20.63	*4947	-.1278	20.63	*4947	-.1278	20.63	*4947	-.1278	20.63
51.66	*2970	-.1589	*0258	*0520	75.00	30.73	*3748	-.1604	30.73	*3748	-.1604	30.73	*3748	-.1604	30.73
102.43	*3165	-.1545	*0512	*104	75.00	40.86	*2935	-.1597	40.86	*2935	-.1597	40.86	*2935	-.1597	40.86
81.61	*3056	-.1570	*0408	*087	75.00	51.63	*2169	-.1770	51.63	*2169	-.1770	51.63	*2169	-.1770	51.63
10.45	*3164	-.1545	*0512	*110	75.00	61.64	*2207	-.1770	61.64	*2207	-.1770	61.64	*2207	-.1770	61.64
112.32	*3216	-.1534	*0512	*110	75.00	81.65	*2314	-.1780	81.65	*2314	-.1780	81.65	*2314	-.1780	81.65
153.24	*3386	-.1495	*0766	*121	75.00	102.68	*2446	-.1780	102.68	*2446	-.1780	102.68	*2446	-.1780	102.68
						153.10	*2636	-.1780	153.10	*2636	-.1780	153.10	*2636	-.1780	153.10

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	RN/IN	PJ	THEJ	D*	DJ	DJ/DB	XJ/DB	RN/IN	PJ	
2.70	20.00	.14	.25	.10	0.00	2.70	20.00	.14	.25	.10	0.00	2.70	20.00	.14	
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	PF	TOF	RN/IN	MF	TOF	PF	
2.50	95.0	1.96	1.40	15.0	.55	2.50	95.0	1.96	1.40	15.0	.55	2.50	95.0	1.96	
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPB	PC/PF	PB/PF	CPB	PC/PF	PB/PF	CPB	
.49	*4973	-.1136	*0003	-.0017	75.00	.49	*5069	-.1128	.49	*5069	-.1128	.49	*5069	-.1128	.49
.95	*5065	-.1116	*0005	-.001	75.00	2.00	*5219	-.1081	2.00	*5219	-.1081	2.00	*5219	-.1081	2.00
5.07	*5193	-.1087	*0025	*003	75.00	5.06	*5227	-.1079	5.06	*5227	-.1079	5.06	*5227	-.1079	5.06
2.01	*5197	-.1086	*0010	0.000	75.00	20.48	*4952	-.1278	20.48	*4952	-.1278	20.48	*4952	-.1278	20.48
18.06	*4585	-.1224	*0090	*017	75.00	51.50	*3928	-.1604	51.50	*3928	-.1604	51.50	*3928	-.1604	51.50
30.56	*4170	-.1318	*0153	*031	75.00	75.00	*2962	-.1604	75.00	*2962	-.1604	75.00	*2962	-.1604	75.00
51.27	*3166	-.1545	*0256	*054	75.00	118.21	*2958	-.1770	118.21	*2958	-.1770	118.21	*2958	-.1770	118.21
61.20	*1715	-.1873	*0406	*087	75.00	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71
111.80	*1240	-.1980	*0559	*120	75.00	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71
152.61	*1386	-.1948	*0763	*166	75.00	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71
91.43	*1376	-.1950	*0457	*098	75.00	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71
112.15	*1261	-.1975	*0561	*121	75.00	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71
112.37	*1265	-.1975	*0562	*121	75.00	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71
153.22	*1420	-.1940	*0766	*166	75.00	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71	*1726	-.1726	152.71

## GROUP 7A (Continued)

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	M'	THEJ	D*	DJ	DJ/DB	XJ/DB	M'	THEJ	D*	DJ	DJ/DB	XJ/DB	M'	THEJ	D*	DJ	DJ/DB	XJ/DB	M'			
2.70	20.00	*14	*25	*10	0.50	2.70	20.00	*14	*25	*10	0.50	2.70	20.00	*14	*25	*10	0.50	2.70	20.00	*14	*25	*10	0.50	2.70	20.00	*14	
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	
2.50	95.0	1.96	1.40	15.0	*55	PC/PF	CPB	RMF	CT	TC	PC/PF	CPB	PC/PF	CPB													
-49	-5023	-0.1125	*0002	-0.002	75.00	-49	-4982	-0.1135	-0.1135	-0.1135	-0.002	-49	-4982	-0.1135	-0.1135	-0.1135	-0.1135	-49	-4982	-0.1135	-0.1135	-0.1135	-0.002	-49	-4982	-0.1135	-0.1135
2.01	5191	-0.1087	*0010	*000	75.00	5.06	-0.1090	-0.1090	-0.1090	-0.1090	5.06	5.06	-0.1090	-0.1090	-0.1090	-0.1090	5.06	-0.1090	-0.1090	-0.1090	-0.1090	5.06	-0.1090	-0.1090	-0.1090	-0.1090	
5.06	5252	-0.1073	*0025	*003	75.00	5.06	-0.1241	-0.1241	-0.1241	-0.1241	5.06	5.06	-0.1241	-0.1241	-0.1241	-0.1241	5.06	-0.1241	-0.1241	-0.1241	-0.1241	5.06	-0.1241	-0.1241	-0.1241	-0.1241	
20.44	4573	-0.1227	*0102	*020	75.00	68.26	-0.2713	-0.2713	-0.2713	-0.2713	68.26	68.26	-0.2713	-0.2713	-0.2713	-0.2713	68.26	-0.2713	-0.2713	-0.2713	-0.2713	68.26	-0.2713	-0.2713	-0.2713	-0.2713	
51.12	3421	-0.1487	*0255	*054	75.00	81.01	-0.4118	-0.4118	-0.4118	-0.4118	81.01	81.01	-0.4118	-0.4118	-0.4118	-0.4118	81.01	-0.4118	-0.4118	-0.4118	-0.4118	81.01	-0.4118	-0.4118	-0.4118	-0.4118	
81.11	2686	-0.1654	*0405	*087	75.00	111.74	-0.1630	-0.1630	-0.1630	-0.1630	111.74	111.74	-0.1630	-0.1630	-0.1630	-0.1630	111.74	-0.1630	-0.1630	-0.1630	-0.1630	111.74	-0.1630	-0.1630	-0.1630	-0.1630	
111.71	2473	-0.1702	*0558	*121	75.00	132.26	-0.1624	-0.1624	-0.1624	-0.1624	132.26	132.26	-0.1624	-0.1624	-0.1624	-0.1624	132.26	-0.1624	-0.1624	-0.1624	-0.1624	132.26	-0.1624	-0.1624	-0.1624	-0.1624	
152.52	22309	-0.1739	*0762	*165	75.00	152.29	-0.1657	-0.1657	-0.1657	-0.1657	152.29	152.29	-0.1657	-0.1657	-0.1657	-0.1657	152.29	-0.1657	-0.1657	-0.1657	-0.1657	152.29	-0.1657	-0.1657	-0.1657	-0.1657	
117.89	3281	-0.1519	*0589	*127	75.00	152.29	-0.1657	-0.1657	-0.1657	-0.1657	152.29	152.29	-0.1657	-0.1657	-0.1657	-0.1657	152.29	-0.1657	-0.1657	-0.1657	-0.1657	152.29	-0.1657	-0.1657	-0.1657	-0.1657	
132.26	2670	-0.1657	*0661	*143	75.00	152.29	-0.1657	-0.1657	-0.1657	-0.1657	152.29	152.29	-0.1657	-0.1657	-0.1657	-0.1657	152.29	-0.1657	-0.1657	-0.1657	-0.1657	152.29	-0.1657	-0.1657	-0.1657	-0.1657	
54.49	3954	-0.3954	-0.1503	*0272	*057	75.00	152.29	-0.1657	-0.1657	-0.1657	-0.1657	152.29	152.29	-0.1657	-0.1657	-0.1657	-0.1657	152.29	-0.1657	-0.1657	-0.1657	-0.1657	152.29	-0.1657	-0.1657	-0.1657	-0.1657

## GROUP 7B

MJ	THEJ	D*	RJ	DJ/DB	XJ/DB	MJ	THEJ	D*	DJ	DJ/DB	MJ	THEJ	D*	DJ	DJ/DB
2.70	20.00	.42	.50	.20	-0.60	2.70	20.00	.28	.30	.67	2.70	20.00	.58	.60	.67
4	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	RN/IN	PC/PF	CPB	MF	TOF	RN/IN
2.50	95.0	1.96	1.40	15.0	.55	TC	TC	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
PC/PF	PR/PF	CPR	RMF	C1	.50	.4996	.4996	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
5.07	*50.11	-.1095	*0012	-.007	75.00	*.58	*.58	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
1.00	*52.06	-.1052	*0020	-.005	75.00	1.00	*.5287	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
2.01	*51.71	-.1059	*0000	-.000	75.00	2.01	*.5189	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
5.07	*44.15	-.1212	*0161	-.013	75.00	5.15	*.4595	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
10.20	*31.06	-.1381	*0294	-.036	75.00	10.21	*.3665	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
12.79	*33.03	-.1469	*0256	-.047	75.00	15.36	*.2155	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
14.09	*31.37	-.1506	*0222	-.053	75.00	20.50	*.2241	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
15.35	*30.11	-.1531	*0307	-.058	75.00	30.58	*.2424	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
20.47	*29.63	-.1544	*0410	-.040	75.00	51.40	*.2687	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
30.60	*31.40	-.1565	*0613	-.126	75.00	81.02	*.3088	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
17.00	*29.35	-.1530	*0341	-.066	75.00	112.51	*.3356	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
51.22	*34.45	-.1436	*1026	-.216	75.00	112.51	*.3356	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
81.31	*38.12	-.1357	*1628	-.349	75.00	112.51	*.3356	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
112.61	*40.80	-.1299	*2253	-.4840	75.00	112.51	*.3356	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
149.58	*4350	-.1240	*2996	-.6490	75.00	112.51	*.3356	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN

MJ	THEJ	D*	RJ	DJ/DB	XJ/DB	MJ	THEJ	D*	DJ	DJ/DB	MJ	THEJ	D*	DJ	DJ/DB
2.70	20.00	.28	.50	.20	-0.20	2.70	20.00	.28	.50	.67	2.70	20.00	.58	.60	.67
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	RN/IN	PC/PF	CPB	MF	TOF	RN/IN
2.50	95.0	1.96	1.40	15.0	.55	TC	TC	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
PC/PF	PR/PF	CPR	RMF	C1	.50	.4996	.4996	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
1.53	*49.91	-.1099	*0010	-.007	75.00	*.51	*.51	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
1.01	*53.11	-.1029	*0020	-.005	75.00	1.03	*.5332	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
2.02	*52.66	-.1039	*0040	-.000	75.00	2.01	*.5259	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
2.81	*51.40	-.1066	*0056	*.003	75.00	10.21	*.4120	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
5.22	*46.97	-.1164	*0105	*.014	75.00	55.06	*.4736	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
50.53	*19.90	-.1757	*1012	*.213	75.00	12.78	*.3635	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
80.01	*23.98	-.1672	*1622	*.347	75.00	17.00	*.2345	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
111.92	*26.64	-.1612	*2242	*.483	75.00	20.48	*.1680	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
149.26	*29.10	-.1547	*2969	*.648	75.00	21.77	*.1866	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
20.43	*15.88	-.1824	*0469	*.081	75.00	23.45	*.1928	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
31.46	*17.67	-.1811	*0630	*.129	75.00	30.59	*.1245	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
40.63	*1863	-.1785	*0814	*.170	75.00	51.18	*.1555	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
						81.23	*.1680	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
						111.73	*.1727	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
						148.37	*.2366	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN
						148.37	*.2972	PC/PF	CPB	MF	MF	TOF	PF	GJ	RN/IN

## GROUP 23 (Continued)

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	MJ	THEJ	D*	DJ	DJ/DB	
	20.00	.28	.50	.20	0.33	2.70	20.00	.28	.50	.20	.18
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	
2.50	95.0	1.96	1.40	15.0	.55	2.50	95.0	1.96	1.40	1.50	.55
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPH	RMF	CT	11
.49	.4994	-.1098	.0010	-.007	.75.00	.49	.4903	-.1118	.0010	-.007	.11
1.02	.5178	-.1036	.0020	-.0050	.75.00	1.01	.5203	-.1053	.0020	-.0050	.0169
5.07	.4899	-.1119	.0101	.0131	.75.00	5.06	.6762	-.1149	.0101	-.0113	.0169
20.59	.2320	-.1685	.0410	.081	.75.00	20.46	.2277	-.195	.0410	-.0410	.0169
30.59	.1903	-.1777	.0612	.126	.75.00	30.59	.3126	-.1508	.0612	-.127	.0169
51.18	.1206	-.1929	.1025	.216	.75.00	51.26	.1260	-.1918	.0126	-.1164	.0164
81.21	.1337	-.1901	.1627	.349	.75.00	81.30	.1666	-.1785	.1678	.1443	.0164
111.91	.1745	-.1811	.2242	.483	.75.00	111.84	.2482	-.1649	.2240	.1443	.0164
148.61	.2240	-.1703	.2976	.645	.75.00	148.66	.3188	-.1495	.2477	.1443	.0164
81.26	.1369	-.1984	.1628	.348	.75.00	30.62	.3174	-.1478	.0111	.0111	.0164
						20.48	.2304	-.1689	.0410	.0410	.0164
						25.41	.2957	-.1545	.0509	.0509	.0164
						28.00	.3118	-.1510	.0264	.0264	.0164
						30.47	.3138	-.1506	.0610	.0610	.0164
						33.15	.2770	-.1586	.0664	.0664	.0164
						35.7	.2613	-.1621	.0714	.0714	.0164
						4C.66	.2132	-.1732	.166	.166	.0164
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	
2.50	95.0	1.96	1.40	15.0	.55	2.50	95.0	1.96	1.40	1.50	.55
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPH	RMF	CT	11
.51	.5006	-.1096	.0010	-.007	.75.00	.51	.4970	-.1101	.0010	-.007	.11
1.01	.5297	-.1032	.0020	-.0050	.75.00	1.01	.5247	-.1042	.0020	-.0050	.0161
5.07	.4916	-.1115	.0101	.013	.75.00	5.07	.4882	-.1123	.0101	-.0113	.0161
20.46	.3243	-.1482	.0410	.081	.75.00	20.47	.3206	-.1491	.0410	-.0410	.0161
30.57	.2739	-.1593	.0612	.125	.75.00	30.55	.2953	-.1546	.0611	-.125	.0161
51.03	.1664	-.1829	.1022	.215	.75.00	51.10	.2097	-.1734	.1024	.1112	.0161
81.22	.2667	-.1653	.1627	.348	.75.00	81.19	.3102	-.1514	.1626	.1443	.0161
111.81	.3261	-.1479	.2239	.483	.75.00	111.87	.3902	-.1318	.2242	.0831	.0161
						4C.66	.3000	-.1258			

**GROUP 7B (Continued)**

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	MJ	THEJ	D*	DJ	DJ/DB	A/J/DN
2.70	20.00	*.28	*.50	*.20	0.67	2.70	20.00	*.28	*.50	*.20	*.046
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	NN/IN
2.50	95.00	1.96	1.40	15.0	*.55	3.50	95.00	*.69	1.40	15.0	.190
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPB	RMF	CT	.14
*.50	*1995	*1098	*.007	75.00	*.69	*.000	*2865	*.000	*.000	*.003	.44
1.01	*5285	*1095	*.010	*.005	75.00	*.000	*2275	*.0901	*.090	*.2290	.060
5.07	*4874	*1125	*.0020	*.005	75.00	*.013	*.57	*.0870	*.0580	*.174	.174
20.49	*1219	*1488	*.0110	*.010	75.00	*.0410	*.081	*.3412	*.0768	*.2350	.213
29.73	*2596	*1625	*.0595	*.0595	75.00	*.122	*.122	*.2085	*.0818	*.1170	.253
39.63	*2443	*1667	*.0763	*.0763	75.00	*.165	*.165	*.43311	*.0697	*.4410	.963
51.09	*1711	*1819	*.1023	*.1023	75.00	*.216	*.216	*.3695	*.0852	*.3230	.704
81.18	*2502	*1645	*.1626	*.1626	75.00	*.348	*.348	*.317.58			
111.83	*3260	*1479	*.2260	*.2260	75.00	*.483	*.483				
151.36	*4228	*1266	*.3032	*.3032	75.00	*.657					
MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	MJ	THEJ	D*	DJ	DJ/DB	A/J/DN
2.70	20.00	.28	.50	*.20	-1.20	2.70	20.00	*.28	*.50	*.20	*.046
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	NN/IN
3.50	95.00	.69	1.40	15.0	*.50	4.50	95.00	*.28	1.40	15.0	.44
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPB	RMF	CT	.14
28.67	*2226	*0825	*.0290	*.060	--	1.75	*1903	*.0571	*.0006	*.001	.14
57.42	*3630	*0766	*.0580	*.124	--	71.24	*2579	*.0528	*.0440	*.094	.14
86.43	*3722	*0132	*.080	*.189	--	142.76	*2969	*.0496	*.0880	*.191	.14
114.96	*3953	*0705	*.1170	*.253	--	285.88	*3357	*.0469	*.1760	*.383	.14
230.28	*4580	*0632	*.2350	*.512	--						
316.72	*4863	*066	*.3230	*.706	--						
431.52	*5248	*0554	*.4410	*.965	--						

**GROUP 7B (Continued)**

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB
2.70	20.00	.20	.50	.20	.1.20
MF	TOF	PF	GJ	LENGTH	RN/IN
4.50	95.00	*.28	1.40	15.0	*.49
PC/PF	PB/PF	CPB	RMF	CT	TC
1.30	*2150	~0554	*0007	.001	--
71.45	*2487	~0530	*0440	*.094	--
143.00	*2898	~0572	*0880	*.191	--
285.99	*3824	~0436	*1760	*.383	--
142.82	*3020	~0495	*0880	*.191	--
572.57	*4376	~0396	*3550	*.774	--
787.43	*4773	~0439	*.870	1.066	--
1073.95	*5230	~0336	*6620	1.457	--

**GROUP 7C**

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	THEJ	D*	DJ	DJ/DB	XJ/DB
2.70	20.00	*.42	.75	.30	-0.60	2.70	20.00	*.42	.75	*.30
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH
2.50	95.00	1.56	1.40	15.0	*.55	PC/PF	PB/PF	CPB	RMF	CT
PC/PF	PB/PF	CPB	RMF	CT	TC	10.53	*2288	*1603	*0470	79.00
10.41	*3015	*0469	*0224	75.00	30.81	20.68	*2574	*1522	*0912	75.00
20.69	*3429	*1365	*0933	*1843	75.00	30.81	*2954	*1466	*1389	75.00
30.82	*3732	*1302	*2333	*491	75.00	7.94	*2550	*1548	*0358	75.00
81.81	*4723	*1097	*3688	*789	75.00	51.86	*3397	*1372	*2338	75.00
112.33	*5033	*1022	*5064	*1091	75.00	81.76	*3996	*1248	*3687	75.00
135.63	*5335	*0989	*5335	*1322	75.00	112.37	*4421	*1129	*5066	75.00
						136.19	*4688	*1104	*6140	1.327
										75.00

GROUP 7C (Continued )

MJ	THE J	D*	DJ	DJ/DB	XJ/DB	MJ	THE J	D*	DJ	DJ/DR	KJ/KH	
MJ	THE J	D*	DJ	DJ/DB	XJ/DB	MJ	THE J	D*	DJ	DJ/DR	KJ/KH	
2.70	20.00	D*	.42	.75	.30	-0.20	2.70	20.00	.42	.75	.30	
MF	TOF	PF	1.96	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	
2.50	95.0	1.96	1.40	15.0	.55	.55	2.50	95.0	1.96	1.40	15.0	
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	DB/PF	CPB	RMF	CT	DB/PF	
7.95	+2986	-1457	+0159	-0.0127	75.00	+51	4974	-104	+0023	-0.0116	71.00	
10.64	+1598	-1746	+0213	+0.104	75.00	+99	5484	+0038	+0065	+0.0111	15.00	
30.95	+2229	-1615	+0619	+0.307	75.00	+02	5187	-1000	+0091	+0.0077	15.00	
51.87	+2644	-1529	+1037	+0.517	75.00	+81	4918	-1056	+0126	+0.017	15.00	
51.87	+2648	-1528	+1037	+0.517	75.00	+08	4206	-1204	+0279	+0.0249	75.00	
82.11	+3285	-1395	+1642	+0.812	75.00	+44	1673	-071	+0471	+0.062	75.00	
112.63	+3226	-1304	+2255	+1.124	75.00	+56	1780	-1780	+0791	+1.133	75.00	
136.95	+4028	-1241	+2739	+1.368	75.00	+00	3050	-1444	+0344	+0.057	75.00	
								20.1	+1750	+0913	+1.184	75.00
								12.99	+1799	+0586	+1.108	75.00
								30.83	+1815	+1701	+1.390	75.00
								51.11	+2322	+1596	+2304	75.00
								81.78	+2801	+1496	+3687	75.00
								112.39	+3174	+1418	+5067	75.00
								126.91	+3316	+1389	+5721	1.235
MJ	THE J	D*	DJ	DJ/DB	XJ/DB	MJ	THE J	D*	DJ	DJ/DR	KJ/KH	
2.70	20.00	D*	.42	.75	.30	0.33	2.70	20.00	.42	.75	.30	
MF	TOF	PF	1.96	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	
2.50	95.0	1.96	1.40	15.0	.55	.55	2.50	95.0	1.96	1.40	15.0	
PC/PF	PH/PF	CPB	RMF	CT	TC	PC/PF	PB/PF	CPB	RMF	CT	PH/PF	
1.05	+4957	-1048	+0023	-0.016	75.00	+50	4951	-1049	+0022	-0.0115	71.00	
7.84	+5603	-0955	+0047	-0.0102	75.00	+01	5404	-0555	+0047	-0.0116	71.00	
10.42	+2445	-1570	+053	+0.057	75.00	+64	2673	+1523	+0470	+0.082	75.00	
12.99	+2161	-1629	+0470	+0.082	75.00	+45	2878	+1480	+0606	+0.132	75.00	
15.44	+1817	-1586	+0108	+0.108	75.00	+29	3529	+1345	+0586	+0.105	75.00	
15.46	+1825	-1609	+0696	+0.132	75.00	+08	2359	+1759	+0814	+0.158	75.00	
								20.71	+1693	+1726	+0933	75.00
								30.72	+1693	+1726	+1383	75.00
								51.68	+2724	+1512	+2330	75.00
								51.71	+2722	+1512	+2331	75.00
								81.80	+4197	+1206	+3646	75.00
								112.33	+5601	+0914	+5068	1.092
								126.45	+2365	+1587	+3446	75.00
								126.31	+3249	+1403	+3249	75.00
								122.31	+3249	+12491	+3067	1.312
								134.60	+3788	+12491	+3067	1.312

**GROUP 7C (Continued)**

MJ	THE J	D*	DJ	DJ/DB	XJ/DB	MJ	THE J	D*	DJ	DJ/DB	
2.70	20.00	*4.2	*7.5	*.30	0.67	2.70	20.00	*4.2	*7.5	*.30	
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENTH	
2.50	95.0	1.96	1.40	15.0	*.95	2.50	95.0	1.96	1.40	25.0	
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	CPB	RMF	CT	TC	
1.01	*5416	-*0953	*0046	-.0110	75.00	.51	*4971	-.1045	*0116	75.00	
10.43	*3690	-*1311	*0559	*.0830	75.00	1.01	*5453	-.0945	*0046	75.00	
13.03	*2683	-*1520	*0587	*.108	75.00	20.71	*1574	-.1548	*0586	75.00	
7.85	*3614	-*1368	*0354	*.057	75.00	20.71	*1751	-.0934	*1058	75.00	
15.42	*2966	-*1462	*095	*.132	75.00	15.41	*1495	-.1767	*0816	75.00	
18.16	*2648	-*1528	*0119	*.1592	75.00	10.43	*2472	-.1564	*0695	75.00	
20.71	*1582	-*1149	*0334	*.1844	75.00	30.64	*2817	-.1492	*0470	75.00	
30.79	*2194	-*1622	*1388	*.284	75.00	*2125	*1636	*1.140	*2125	75.00	
51.88	*3985	-*375	*239	*.493	75.00	16.34	*1634	*1388	*285	75.00	
81.77	*4803	-*1080	*3616	*.780	75.00	*137	*1634	*1388	*284	75.00	
112.41	*6430	-*0742	*5067	*1.092	75.00	*12.5	*1079	*1415	*2322	75.00	
134.89	*6118	-*0695	*6081	*1.315	75.00	*12.5	*4906	*1079	*3674	75.00	
						127.16	*7234	*0575	*5737	*1.718	75.00

**GROUP 8A**

MJ	THE J	D*	DJ	DJ/DB	XJ/DB	MJ	THE J	D*	DJ	DJ/DB
2.70	0.00	*352	*628	*.25	0.00	2.70	0.00	*352	*628	*.25
MF	TOF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENTH
2.50	95.00	0.42	1.40	15.0	*.12	2.50	95.00	0.85	1.40	25.0
PC/PF	PB/PF	CPB	RMF	CT	TC	PC/PF	CPB	RMF	CT	TC
*52	*4539	-*1268	*0016	*.011	65.00	*51	*4762	-.197	*0116	65.00
35.42	*2017	-*1824	*0596	*.117	65.00	17.75	*1723	-.1891	*060	65.00
51.62	*2147	-*1792	*1118	*.231	65.00	29.52	*1730	-.189	*031	65.00
59.24	*2245	-*1794	*1124	*.233	65.00	1730	*1925	-.1865	*1662	65.00
82.73	*2251	-*1764	*2610	*.559	65.00	59.02	*1930	-.1844	*1662	65.00
118.06	*2383	-*1740	*375	*.804	65.00	88.79	*2101	-.1805	*2001	65.00
118.23	*2318	-*1741	*3756	*.805	65.00	118.37	*2163	-.1791	*3135	65.00
177.58	*2418	-*1732	*5595	*1.216	65.00	119.04	*2163	-.1791	*3156	65.00
						177.34	*2301	-.1759	*5595	65.00

**GROUP 8A (Continued)**

MJ	THEJ	D*	DJ	DJ/DB	XJ/DB	MJ	THEJ	D*	DJ	DJ/DB	1.J/DW
2.±70	U.00	*352	.628	*25	0.00	2.71	0.00	+352	+628	*25	0.00
MF	TDF	PF	GJ	LENGTH	RN/IN	MF	TOF	PF	GJ	LENGTH	MF/1J
2.±70	95.00	1.±2.	1.±40	15.±0	*35	2.50	95.00	1.±70	1.±46	1.±70	1.±70
PC/PF	PQ/PF	CPB	RMF	CT	TC	PC/PF	PR/PF	CPB	RMF	CT	1.
18.13	*4819	-1184	*0016	-0.011	65.00	-	-	-	-	-	1.
18.25	*1504	-1941	*0572	-0.111	65.00	*51	*4806	-187	*0016	*0016	49.00
59.27	*1964	-1941	*0576	-0.112	65.00	17.66	*1436	-1957	*057	*108	49.00
78.94	*2053	-1836	*1870	-0.396	65.00	44.34	*1856	-1861	*1600	*293	65.00
79.00	*2053	-1816	*2491	-0.533	65.00	58.99	*1953	-1859	*1859	*394	65.00
79.00	*2050	-1816	*2493	-0.532	65.00	58.99	*1953	-1859	*1861	*394	65.00
91.67	*2210	-1801	*3113	-0.669	65.00	88.62	*2102	-1805	*2796	*600	65.00
111.37	*2281	-1787	*3735	-0.867	65.00	118.06	*2202	-1782	*3725	*804	65.00
1177.67	*2361	-1745	*5606	-1.308	65.00	147.53	*2290	-1762	*4655	*1.018	65.00
						176.92	*2370	-1743	*5582	1.221	65.00

GROUP B

## GROUP 98 (Continued)

MJ	THEJ	D#	DJ	DJ/DB	XJ/DB
1.00	0.00	.14	.14	.056	0.00
MF	TOF	PF	GJ	LENGTH	RN/IN
2.50	95.00	1.27	1.40	15.0	.35
PC/PF	PB/PF	CPB	RMF	CT	TC
.51	.4840	-.1179	.0001	.0000	65.00
18.10	.3286	-.1534	.0005	.001	65.00
18.16	.3255	-.1534	.0005	.001	65.00
18.16	.3285	-.1534	.0005	.001	65.00
59.33	.2851	-.1633	.0016	.003	65.00
78.95	.3246	-.1563	.0021	.005	65.00
79.45	.3244	-.1544	.0021	.005	65.00
99.04	.3558	-.1472	.0026	.007	65.00
146.58	.4158	-.1335	.0036	.010	65.00
177.17	.4505	-.1255	.0047	.012	65.00

MJ	THEJ	D#	DJ	DJ/DB	XJ/DB
1.00	0.00	.14	.14	.056	0.00
MF	TOF	PF	GJ	LENGTH	RN/IN
2.50	95.00	1.70	1.40	15.0	.47
PC/PF	PB/PF	CPB	RMF	CT	TC
17.66	.3316	-.1527	.0005	.001	65.00
.48	.4809	-.1186	.0000	.001	65.00
44.25	.2522	-.1709	.0012	*	65.00
44.25	.2522	-.1709	.0012	.003	65.00
58.44	.2870	-.1629	.0016	.004	65.00
59.44	.2874	-.1620	.0016	.004	65.00
88.50	.3371	-.1515	.0023	.006	65.00
118.02	.3787	-.1419	.0031	.008	65.00

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## 13. ABSTRACT

Results of supersonic wind tunnel tests are presented which show the effects of varying nozzle geometry, location, and supply pressure on the base pressure of a cylindrical body at zero angle of attack. The purpose of the tests was to investigate the parametric influences in the regions where base pressure is near a minimum, which occurs in the lower range of thrust levels. A bibliography of related experimental results is also included.

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